

# **Supply Chain Innovation in a Global Multi-Business Enterprise**

## **Techniques Applied, Culture Change Challenges Met & Benefits Realized**

James J. Curry

Partner

LogiSys Associates  
412 Main Street  
Ridgefield, CT 06877  
USA  
(203) 431-3905

Robert P. Petrich

Corporate Director of Logistics and Transportation  
Rohm and Haas Company  
Independence Mall West  
Philadelphia, PA 19105  
USA  
(215) 592-3068



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Rohm and Haas Company manufactures intermediate specialty chemicals. The company has about \$4 billion in sales in over 100 countries and nearly half of its sales outside the United States. (Figure 1). It operates 36 plants around the world, with about 11,000 employees. Figure 2 shows the business group structure that was in place at the time of this story, from 1990-1998. The biggest business was called Polymers, Resins & Monomers, a large group of acrylic polymer-based products—about half of the company. The other half is split roughly equally between Agricultural Chemicals, the Industrial Chemicals group, and the acrylic plastics businesses.

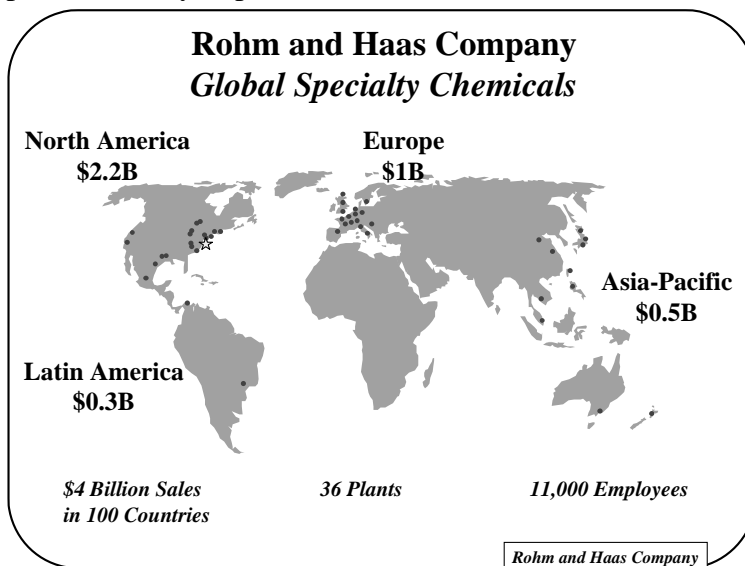


Figure 1

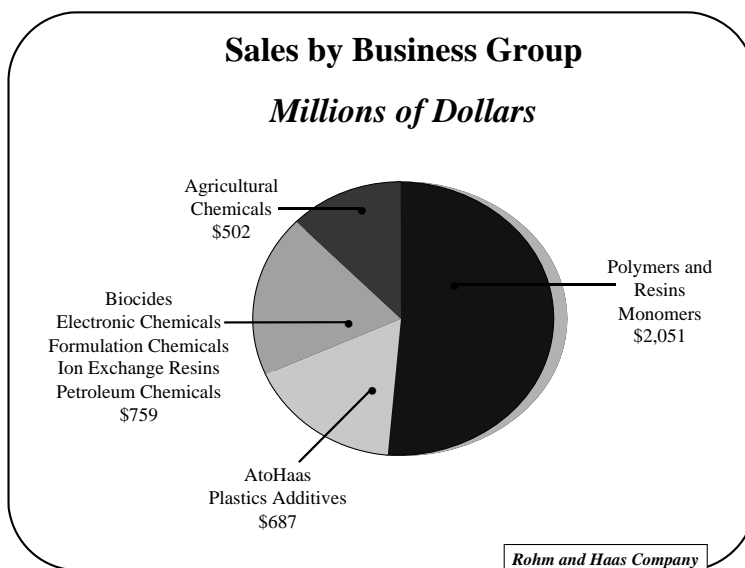


Figure 2

Figure 3 illustrates the company's widely varying product lines and their end-use markets. The biggest part of the company is the acrylic monomers and polymers. Since the company makes intermediates, so we are usually one or two steps removed from a consumer product that you might purchase or see in the marketplace. But Rohm and Haas products are the basis for high-quality acrylic products in many markets:

- acrylic paints and caulks
- floor polishes
- detergents
- impact-resistant vinyl siding and windows
- impact-resistant clear vinyl bottles and blister packages

Rohm and Haas biocides are used to prevent the growth of microbes in shampoo, in metalworking fluids, in cosmetics, and in paints, as well as in water treatment.

<b>Rohm and Haas Company</b>	
<b>Products</b>	<b>Markets</b>
<b>Acrylic Monomers and Polymers</b>	<b>Paints/industrial coatings</b> <b>Textile/paper coatings</b> <b>Adhesives/caulks/polishes</b> <b>Detergents</b> <b>Multigrade lubricants</b>
<b>Biocides</b>	<b>Acrylic moldings/signs</b> <b>Vinyl siding/packaging</b> <b>Water treatment</b>
<b>Ion Exchange Resins</b>	<b>Cosmetics</b> <b>Pharmaceuticals</b> <b>Mining</b>
<b>Agricultural Chemicals</b>	<b>Pest protection - fruits, gardens, landscapes</b>
<b>Electronic Chemicals</b>	<b>Printed wiring boards</b> <b>Semiconductor production</b>

*Rohm and Haas Company*

Figure 3

Ion Exchange Resins is another very broad group used for a wide variety of purposes ranging from recovering pharmaceutical drugs, from fermentation broths, to recovering uranium from mining fluids and purifying water at all levels, from your home water softener all the way out through nuclear power plant steam generators or the ultra-pure water used in semiconductor production. Also in the semiconductor production industry, the newest and highest growth segment, Electronic Chemicals. Shipley and other recently-acquired divisions provide products for the electronic materials business. The biggest part of that involves production of photoresist products for semiconductor manufacture, as well as products for printed wiring boards. Finally, Rohm and Haas Agricultural Chemicals are used to prevent the growth of fungus in vineyards or to prevent weeds in orchards and in gardens and on golf courses.

So, we have a very wide range of products, several different types of businesses, and we need to find a way to run the supply chain for all these types of products in a very efficient manner all across the world.

The organization of Rohm and Haas has been evolving toward global business teams for a long time. In 1975 we went to a global business unit, geographical matrix type structure. After that we increasingly turned toward global business unit structures to run businesses worldwide, de-emphasizing the geographical structures. In the mid-1980s we went to true cross-functional business teams with all the functions in a business dedicated to that business, at least with dual reporting lines from production people and research people and dedicated sales forces. We reemphasized the autonomy of global business units in the late 1980s and have worked that way through the current date.

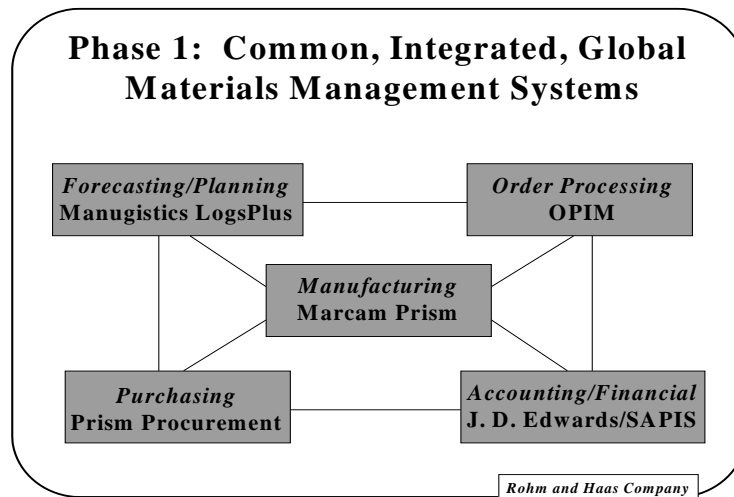
For the purpose of this project, we were working across ten different business units in five groups. A big point to make here is we've been working at cross-functional business units with global scope for a long time. We were not one of those organizations that still are functional 'smokestack' sort of organizations, where you can make a lot of gains just by cutting through the basic smokestacks.

On the subject of culture, our company is a family-based company with a pretty paternalistic culture and very collegial work atmosphere. It has had a strong emphasis on teams, for over twenty years. There was not a lot of focus on accountability. In the last ten to fifteen years, we greatly strengthened customer focus across the whole organization and the autonomous business units were one of the keys ways to achieve that. The company culture has also into one of heroes, where to get that end result for the customer, people would go to extreme measures, and they would get all of their satisfaction out of that. Now we are trying to bring in a planning system for supply chain management that represents a substantial change in the culture. That is part of what we had to work across all these last eight years.

The Rohm and Haas materials management/supply chain effort can be separated into three phases. The first phase was 1991-1995, and that was basically around materials management systems. It was in response to top management request of "How are we ever going to really manage inventory?" From 1993-1995 there was a Supply Chain reengineering phase. That was in response to the question "How are we going to get benefit from these systems that we decided to put in?" The third phase, from 1996 through the next year, is MRP II Class A Business Process Redesign. It is responding to a little bit more frustrated version of that question "When are we ever going to get benefit from these computer systems?"

For each of these, we are going to describe the key change areas involved, some of the concepts and tools we thought were key to our success in those phases, what we achieved, what we did well, and what we did not do so well.

The first phase was centered on common integrated global materials management computer systems. Figure 4 shows the specific systems which we use:



We came from individual systems, mostly proprietary systems, installed across all the plants and different countries. In 1990 the senior executive IT review committee agreed we should buy systems and install them commonly across the whole organization. We bought PRISM from Marcam and installed it for our manufacturing execution system. By the 1994/1995 timeframe, that had been installed in all our plants. We decided to keep our Legacy order processing system called OPIM, which had only been in the United States. We actually rebuilt that and installed it in Europe and put it in place for all of our export shipments from Europe and North America to the rest of the world. We bought the Manugistics LogsPlus forecasting/planning systems and worked with the business units to install those. There was much more variation in how well that was installed, but basically by the end of 1996 it was being used in most of the businesses. We put in J. D. Edwards accounting general ledger in all of our financial entities and production entities all around the world. That was finished by 1995, as well, and SAPIS shown here is a Legacy system that we use for assigning cost and profitability and assets to the business units on a worldwide basis. The last component was Prism Procurement, completed within the last year or so. So this is the suite of materials management systems we now use.

So Phase I was in response to the question “How will we really ever get a better handle on inventory?” (Figure 5).

## Phase 1: New Concepts/Change Impacts

*Response to “How will we ever really manage inventory?”*

Concept:	Change Impacts:
<ul style="list-style-type: none"><li>• Common, global computer systems replacing locally-modified systems</li></ul>	<ul style="list-style-type: none"><li>• Production, order processing, accounting users</li></ul>
<ul style="list-style-type: none"><li>• Standard data structures worldwide</li></ul>	<ul style="list-style-type: none"><li>• Business data owners</li></ul>
<ul style="list-style-type: none"><li>• “Buy, vs. Build” systems strategy</li></ul>	<ul style="list-style-type: none"><li>• IT developers</li></ul>
<ul style="list-style-type: none"><li>• Centralizing local IT/Accounting</li></ul>	<ul style="list-style-type: none"><li>• Local IT/Accounting staff</li></ul>

Figure 5

This began by our senior vice president in charge of North America and all operations putting our former regional financial director on a special assignment to study what we ought to do about this. After taking some courses and evaluating many systems, he came back and proposed that we buy these common global systems and eliminate all the locally modified systems. The goal was to integrate cost and business information more easily across the world, but also to reduce the cost of operating all of these custom systems. Obviously, that was going to impact a lot of people across the organization, in all the production units, the order processing units, and in accounting. Another key concept that we wanted to apply was to have standard data structures worldwide so we could assemble data easily and do business in a true global fashion. Some of the businesses actually have only one or two production sites serving the entire world market, We wanted to be able to use these systems to have someone in Australia take a customer order for an ion exchange resin that is manufactured in France and be able to know if there is inventory there, ship the product and keep the system management of the product throughout the whole process.

We also applied a “buy” instead of “build” system strategy where, if a system would do 80% of what we need, we would buy it off the shelf rather than continuing our previous practice of building our own software. This, obviously, had a major change impact on the IT developers. A lot of people who had built systems like OPIM and SAPIS no longer had jobs (until Year 2000 came up, and now we have many of them back as consultants figuring out the code to make sure that OPIM will work at the turn of the century).

Finally, we wanted to work with the concept of centralizing local IT and accounting support, which had a major impact on people who had been located in all the different production and office sites. If we were going to centralize all of that, there was going to be a major change for them.

## **Phase 1 Results**

We were successful in all the key approaches listed above, and they produced substantial results:

- We really did get those common global computer systems installed, and we turned off the old local systems. It wasn't easy. In the Paris office the day that we went live with their using OPIM instead of their previous French-built order processing system, one of the customer service representatives ran screaming out of her office saying she couldn't take orders with this system and left for a day or so. So culture change was a big impact there. She eventually came back and learned to use this system. People grumbled about having to go to these common systems. They were giving up systems, built for them locally, that seemed more suited to their particular needs and although they grumbled about it they eventually began to use the new. But in many cases it was begrudging use - they weren't always trying to take full advantage of them.
- We did get standard data definitions worldwide. It was a lot of work, but getting the same packaging codes and other business level codes used the same way all over the world and getting the same general ledger lines used in all the countries of the world, so that we could look up costs and add them up around the world more easily, was a big task. It, I think, was crucial to have in place before we started trying to bring in more reengineering or processes.
- We reduced the cost of our IT infrastructure. The mainframe and the mid-frame computers that carry these systems and the mainframe are all located in one computer center in Philadelphia. That has cut down dramatically on the support costs and infrastructure. The other effect of this, almost more important, was stopping local proliferation of systems development. The systems we replaced were supposed to be common but we put them in all the plants where everybody had the code. Everybody's purchasing system and accounts receivable system turned into something a little bit different. Now, we now have standard systems.
- We put all of our accounts payable and local accounting people in North America and in Europe into two regional centers. All the plant level accounting staffs were transferred there or left. That was a major cultural impact on people as well, but led to considerable reduction in the overall cost.

## Phase 1: What We Did Well/Not So Well

Well:	Not So Well:
<ul style="list-style-type: none"><li>• Executive decision</li></ul>	<ul style="list-style-type: none"><li>• Inadequate alignment</li></ul>
<ul style="list-style-type: none"><li>• Systems project management</li></ul>	<ul style="list-style-type: none"><li>• Little process change</li></ul>
<ul style="list-style-type: none"><li>• Data standards</li></ul>	<ul style="list-style-type: none"><li>• Excessive compromise</li></ul>
<ul style="list-style-type: none"><li>• System training</li></ul>	<ul style="list-style-type: none"><li>• Little education</li></ul>

Figure 6

### Where did do well and not so well? (Figure 6)

- We had a good decision, taken at the executive level that we really needed to do this to get a better management of our overall global business. What we didn't do so well was to get good alignment across the entire organization around that decision. There were some executives, some business leaders at the time who felt they didn't have enough say in that decision. Part of what that led to was a sense of, "Well, put those systems in but get them in with minimal effort and minimal disruption to our current way of doing business." We are still today having to go back and fix some of the problems that resulted from that "just get it done" kind of attitude.
- We did a good job on managing the implementation projects, but it included very little process change for the people that were using the systems at that time. So everybody, naturally, focused on maintaining the timeline and the technical issues involving getting the software installed. We didn't bring along the workers to help them understand why we were doing all of this and have them get maximum value from the systems.
- We did get those common data standards and common setup approaches in the way we set up the systems. There is a downside to that, however. If you don't have a stronger overall drive, where everybody knows why you are doing this and they are all bought in to changing the way they are going to work to go to common standards, you often end up going down to the lowest common denominator. So there again, we have some fundamental setup issues now that we are going back to change because we didn't push some people to change from the way they were doing things. We did good system training. Unfortunately, that involved more the buttons you push to do this function than it dealt with understanding why I'm doing this, where it fits in the process, and how it connects to the rest of the organization.



So we ended up with good systems installed, people somewhat begrudging about the use of those systems, but a base from which we could really move forward to look at how to change the way we manage the whole supply chain. There is a lot of debate about whether you do systems first and then reengineer or whether you should reengineer before you install systems. Based on our experience, having those systems there when we came in to change the way people did their work was a benefit. We had worked through a lot of the standardization issues and, if we came up with a new way of doing something, people could go on the system and do it right away. There are many cases where companies who developed a nice reengineering design first then had to wait a year and a half for a system to come into place and lost all the momentum and energy they had had for a new process. The only other answer is to do them both at the same time and that becomes a huge task.

## **Phase II**

In early 1993, it was apparent that the people who were working on the system implementations, were really getting consumed by the technical issues and schedule drive. We weren't focusing on how we would get benefits we said we would get when we first promised to buy the materials. So, at that time they said we needed to put in another effort, alongside of this, to try and drive toward process change. I got assigned to do that task and had a fun six months, or so, of going to reengineering conferences, thinking about what we ought to do and talking to people all around the organization. It became clear that supply chain reengineering was the general area that we needed to work. About that time, we met Malcolm Robinson and Jim Curry from LogiSys. They were doing some of this kind of work with other companies, and they connected pretty well with the Rohm and Haas people. We agreed to have them help us work our way through the project and bring us the ideas we think some of our folks need to get from the outside world. They came in at that point, and we started the reengineering project.

When Logisys began examining the situation at Rohm and Haas, they found a very diverse environment in terms of markets, business units, and geography. Looking at Rohm and Haas from a supply chain perspective, what they saw, besides the thirty-six plants, was a lot of third-party toll manufacturing, third-party toll packaging, and an extensive number of warehouses and terminals. There were also major differences in product lines. Rohm and Haas deals in bulk chemicals as well as packaged chemicals. As a result, the supply chains are very complex and long. There is a lot of international shipping involved. In one early estimate of inventory, we estimated that there could be as much as a third of the inventory in transit at any given time. One of the things we identified early on in the project was that Rohm and Haas does a lot of shipping to itself. Products are made using intermediates, which in turn are made at one plant, moved to another, and so on. So the supply chains are very complex and difficult to manage. The question in the beginning was "How do you make change in a complex environment like that?" When we started the corporate supply chain project, we formed a small team of the best and the brightest R&H people.

We had about six people on the team pulled from various disciplines in the company;

some from businesses, some from operational locations. We worked with them to develop a core design. Early on, we started to look at some of these complex supply chains and realized there was a great deal of hidden cost. We did a “sizing” to estimate the potential opportunity in terms of money and assets tied up, since the accounting systems didn’t clearly identify how much was really being spent on supply chains. It was a real eye-opener when you looked at this whole environment. So, we worked with the team to refine how much was being spent and what some of the benefits should be of improving this whole process.

What Logisys brought in the beginning was a concept and vision called a “Service Channel”, which essentially segments the supply chain into logical channels that are driven from the customer, all the way back to the supplier. This creates a good way to both analyze your supply chain and set supply chain policies through operations. So the core process redesign team began working with this Service Channel concept.

At the same time the business units had a number of initiatives going on to improve their supply chains, reduce cost and assets. The whole project needed to be one where we could not be in conflict with what the businesses were doing, so we had to establish buy-in and alignment across the organization.

Figure 7 outlines the key concepts and change impacts we began to look at.

### **Phase 2: New Concepts/Change Impacts**

<b>Concept:</b>	<b>Change Impacts:</b>
• Streamlining processes	• All process workers
• Multi-channel market offering	• Sales, Marketing, order processor, Logistics, Production
• Partnering with customers/suppliers	• Sales, Purchasing
• Logistics best practices	• Logistics staff
• Leveraging volumes	• Purchasing staff
• Leveraging planning information	• All

Figure 7

A key characteristic observed in Rohm and Haas was an environment of heroics. People were rewarded for heroics. So a lot of disconnects in processes were really fixed up at the end by somebody being a hero. In terms of streamlining processes, that was what we started to really address. We were looking at all of the processes in the supply chain, identifying disconnects, identifying where they could be improved. One of the unique things about reengineering a supply chain is that you have parallel material flow and information flow. So you really need to look at both things, how are materials moving,

how is information moving. It really affects all of the process workers. Of course this is a fairly extensive effort, when you look at the customer and the processes all the way back to the supplier. The concept of the Service Channel really provided multiple operational paths, resulting in what we call a multi-channel market offering. Early on we said that we think this multi-channel model concept could be used generically across the ten businesses. Even though the businesses were different in types of products, markets, and so on, our hypothesis was that we could define a Service Channel concept, which would be corporation wide. We can then refine it by business and, from that, set supply chain policies and operating practices.

Then, the concept of partnering with both suppliers and customers was introduced to the organization. The team developed some really good sub-processes to define how this would work. Early in the project we hit a milestone, where the core team had to go back to the senior management and tell them whether they thought this Service Channel concept would work or not. The team went back with, yes, we think it will work and here is the high level definition of the first channel and how it can work—which I'll describe in a little more detail later. But it keyed on the concept of partnering with customers, suppliers and carriers involved in making this change.. Using 'best practices' we tested, as we went through the whole process sub-process by sub-process, is there something better that can be done? Should we look at some other opportunities? We did take a number of trips to visit with other companies, as it turned out, all outside the chemical industry. Because, as we defined the processes and had the team lay out how they thought company should operate, we wanted to test those concepts, some of which were pretty radical. So we identified other companies that were using the same or similar concepts in a way we felt could be best practice in that selected area, and we tested and got some validation for the selected concept. These were the practices that impacted the operations and the business units, as well as in the logistics corporate department. They were pretty far reaching.

Then we looked at leveraging the very large volumes in transportation, purchasing raw materials and supplies, and so on. Purchased services across businesses, plants and regions were considered to improve costs and service.

Lastly, from a planning perspective, leveraging information was a key. It affected really all of the process workers; people's jobs across all of the operational and planning processes. How can you use planning information to do a better job a week out, a month out, to reduce the heroics involved in fixing things that were disconnected?

### **Service Channel Model**

This Service Channel model deserves more explanation. The three-channel model that the team defined and refined in several iterations (Figure 8), was key to breaking down their supply chain into actionable and manageable pieces.

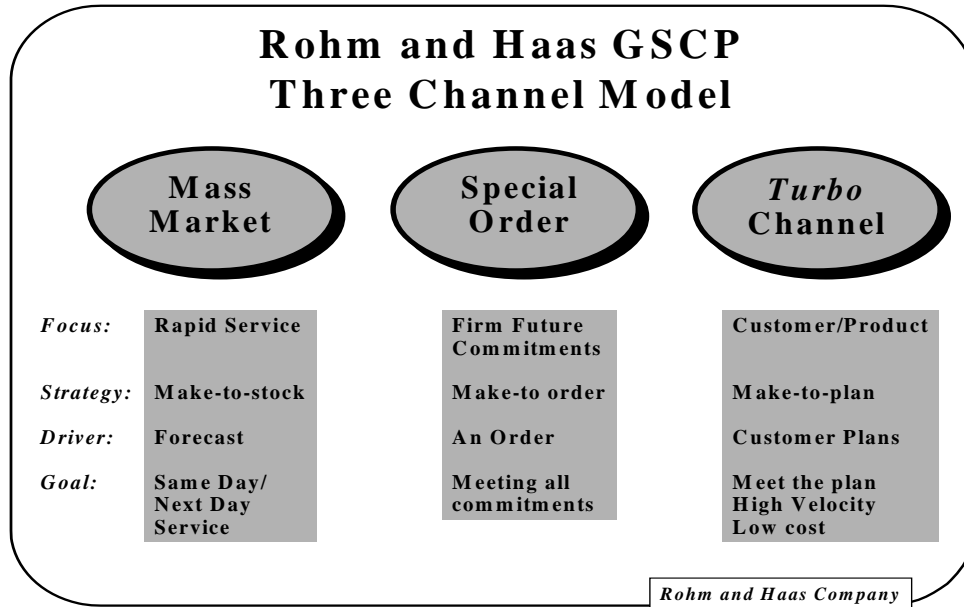


Figure 8

The first channel that the team defined was called the Mass Market Channel. It was interesting that as the team worked over a period of time, the names for these channels changed. At one point, this one had the name Always Available Channel. What it describes is the products that you'd like to keep in inventory where you really want to provide rapid, high-level service. In terms of a strategy, it's a Make-To-Stock strategy.

You are making to inventory, and maintaining inventory in various order fill points. So, therefore, the driver of that channel is a forecast. That forecast comes from Sales/Marketing and drives back through the supply chain. The goal of this channel, as we defined it, is to provide same day or next day service, which was pretty aggressive. In reality, it takes a lot to line up all of the resources in the supply chain to make that happen. So the Mass Market Channel is really key to providing high-level customer service on major products.

The next channel, the Special Order Channel, is one where the strategy is to Make-To-Order. Adding this second channel requires that you separate your products, which is a big change from what had been done before. These products are products you are committing to an order date, let's say five or seven days out. The goal here was to meet all of the commitments that were made to a customer. So if a commitment was made to deliver in five days, the goal was to meet that. These commitments had to be firm.

The last one, which the team called the Turbo Channel, is one where the focus is on particular, important customer/product combinations; the high-volume customers and products. The strategy here is make-to-plan, where the driver is really the customer plan. So you really are running in partnership with the customer to meet their plan, provide high velocity internally in Rohm and Haas and out to the customer, and provide low cost. There are several varieties of this implemented. Some were vendor-managed inventory.

Some were vendor-owned inventory, where Rohm and Haas owned the inventory. Some were running off schedules from the customer. But, the concept of the Turbo Channel was high velocity through the chain. Now, when I described the complex supply chains throughout the company and the extensive internal movement of material, this Turbo Channel was also used for the internal movement.

**Reengineering Approach (Figure 9)**

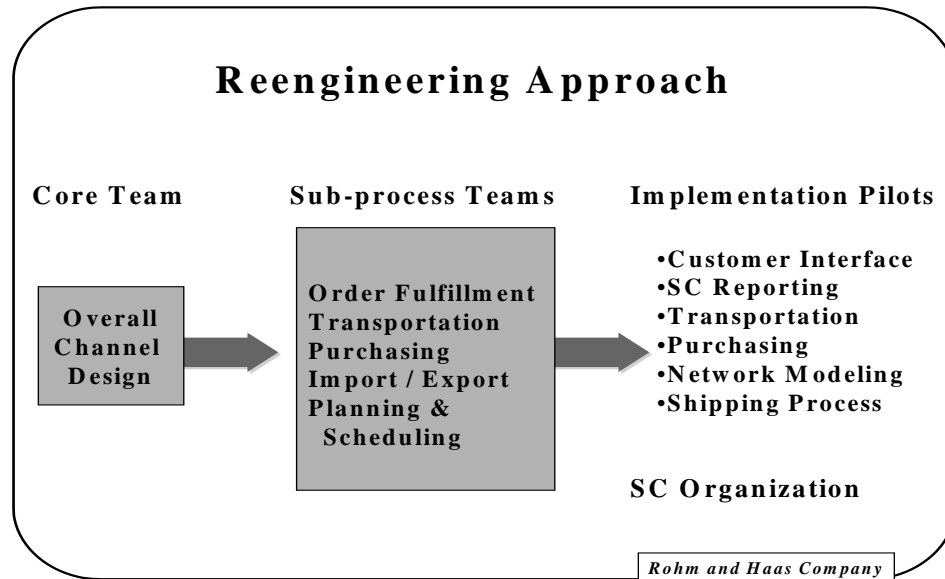


Figure 9

In terms of how we went about it, we talked about the core team starting and doing—the six people put together initially did what we call the 40,000-ft. design of this new supply chain. Then from that, we set up sub-process teams to look at some key areas, where we thought that there would be some big benefits, such as in: order fulfillment, transportation, purchasing, import/export operations, planning, and scheduling. Teams were chartered to develop the details of those sub-processes. From that pilots were kicked off, as well as a change in the organization to support the supply chain. One of the implementation pilots, customer interface pilot, was where the Turbo Channel concept was tested with some key customers and that was done very successfully. As part of that, a sub-team put together a manual that they could use to lay out all of the things that needed to be put in a customer agreement to make it happen. New supply chain reporting focused on process was initiated. In transportation and in purchasing, there were a number of things piloted and where changes in procedures found redundancy, operations were reduced. For instance, duplicate weighings, duplicate testings of materials. As we went through the whole supply chain we looked at ways to improve the detailed processes.

Software - some network optimization software and production scheduling software tools were put in place which the businesses could use to optimize their supply chain. The plant floor shipping process started with some paper reduction efforts and then they

looked at some other ways to improve load factors with some software. This year they are implementing some new transportation management software.

Organization - the supply chain organization has seen extensive change since 1995. Essentially all of the businesses now have a supply chain manager. There's a corporate logistics organization, with regional groups supporting the various geographic entities. There is also a corporate Supply Chain Center, which is a small group of process experts who will consult for the businesses in various areas. This organization was quite a change from the way they had things before, which was essentially a transportation group/purchasing group. Now it is more focused on logistics and supply chain.

### **Phase II Results**

We achieved some important results from the reengineering project:

- We identified major savings opportunities and stated goals that corporate management really wanted to meet. This developed a good bit of energy for change but only in selected areas. It was kind of a smorgasbord, people were picking and choosing from the supply chain design we had and implementing pieces of it, while there wasn't yet a full supply chain effort begun.
- Leveraging procurement of materials, packaging supplies, transportation, and other logistics services really began to start to deliver savings.
- The supply chain organization really got started, with the creation of important positions, filled with very capable people in the businesses and in the corporate group that can make and sustain change.

### **Phase 2: What We Did Well/Not So Well**

<b>Well:</b>	<b>Not So Well:</b>
<ul style="list-style-type: none"><li>• Executive sponsorship</li></ul>	<ul style="list-style-type: none"><li>• Balancing vs. business autonomy</li></ul>
<ul style="list-style-type: none"><li>• Outside expertise/view</li></ul>	<ul style="list-style-type: none"><li>• Internal ownership slow to develop</li></ul>
<ul style="list-style-type: none"><li>• Cross-functional redesign team</li></ul>	<ul style="list-style-type: none"><li>• Less-than-ideal participation</li></ul>
<ul style="list-style-type: none"><li>• Implementation responsibility to BU's</li></ul>	<ul style="list-style-type: none"><li>• Little accountability, spotty implementation</li></ul>

Figure 10

### **What did we do well and not so well? (Figure 10)**

- In terms of the sponsorship of the program, Logisys gives the Rohm and Haas management a lot of credit for sponsoring and effort like this and sticking with it.

They really had to make some tough decisions to keep this project going and to make sure that they got the benefits out of all these systems and process change efforts over this period of time. The thing that was difficult to do was they were committed to business autonomy. Thus, there was always a tug involving balancing how you make change quickly without mandating it. The first approach saw us develop a design and put it out as: 'here are all the things you can do, and we are here to help if you want'.

- The organization was really interested in our input and our view of how processes should be developed, and really eager to take that input and make it work in their process change. In an organization this large, doing things well took a long time to be assimilated, for people to buy into it and to take internal ownership of new ideas. So, it took a little bit longer than we probably should have let it.

Concerning the cross-functional design team, Rohm and Haas has spent a lot of effort in making teams work. It is really a strong suit of the company. They have people trained to be facilitators; they send people to team training. So their teams are really well trained. This cross-functional redesign team really worked well. Now the team turned over in this period of time as it would in any organization. I think, it's just Bob and one other person originally on the project in 1993. But over a period of time the team does change, so you have to bring new people into the team, get them on board and so on. We did have, we'd say, less than ideal participation. Everybody brought on board didn't work out ideally, so we did have some problems. An anecdote—at one point we were having a little problem in the team and some conflict, so we decided that everybody involved would go through Myers-Briggs testing. The testing showed the two leaders from Logisys and Rohm and Haas were both highly-structured go-for-the-target people, and the other people on the team were concept people. So we had a little disconnect in the way we were approaching the management of this whole thing.

Concerning implementation of responsibility to the business units, that was a real high priority and that was what we pushed. It is really the only way to get buy-in to an effort like this and that is to have the businesses which are operating the processes help design them and really take ownership. In the beginning we really didn't hold people accountable for making that happen, so we got spotty implementation. It was pick and choose and pieces were implemented here and there, so we did lose some time. As we got to the 1995 timeframe, and as we were doing the redesign, the computer systems were being implemented and rolled out. What we came to realize was that the computer systems were not really being used. We were making the assumption as we were designing processes that these computer systems were being implemented and used, and we found that that was not the case. That became a problem in our implementation, and led Rohm and Haas to Phase III.

### **Phase III**

So, during 1995 the term “spotty implementation” is a good way to describe what was going on. We basically said the team has developed some great ideas, we’ve done some pilots, we know we can do of these things, but business units you need to really grab hold of them and do them yourselves if we are going to get business benefit from them. But we were getting what some people have called cafeteria-style reengineering - pick and choose, do this piece, do that piece. In fact, our original design had counted on a total integrated process. The other thing we were counting on was that the fundamental processes which the systems were built to support were going to be working. We didn’t realize just how far from true that was.

So, we went to another meeting of the executive IT review committee in September of 1995 and the question again came up, “When are we ever going to get benefit from these computer systems?” We had the executives sitting around asking what can we do, and we threw around a bunch of ideas. One of the ideas we thought was really worthwhile was getting an outside view. Get somebody else who has a different view of how these processes should work and how the system should help and get them in here and look at it. Let’s do it quickly because we must do something different for 1996. This led us to several new concepts which brought major change (Figure 11):

#### **Phase 3: New Concepts/Change Impacts**

<b>Concept:</b>	<b>Change Impacts:</b>
<ul style="list-style-type: none"><li>• Commitment to Change:<ul style="list-style-type: none"><li>– Outside expert’s view</li><li>– Executive education</li><li>– Aligned Process Vision and Savings Targets</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Management, then everyone</li></ul>
<ul style="list-style-type: none"><li>• MRPII Process Framework:<ul style="list-style-type: none"><li>– Formal, disciplined processes</li><li>– Sales &amp; Operations Planning</li><li>– One set of numbers</li><li>– Metrics, accountability</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Management, then everyone</li></ul>
<ul style="list-style-type: none"><li>• Redesigned Business Models:<ul style="list-style-type: none"><li>– Quadrant Analysis</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Sales, Marketing</li></ul>

Figure 11

### **Commitment to Change**

We interviewed several expert consulting firms, and chose Paul Politte. Paul spent about two days looking at three different production units in one of our plants in the Philadelphia area and talking with a business that had done the most work on reengineering, working in close conjunction with our corporate team. He talked to them about how they were doing all their jobs. He reported three basic observations back to



the executive team:

- 1) “It looks like you have great systems installed, from what I understand they are worldwide. That is really good. You are ahead of a lot of companies in that respect.”
- 2) “But you haven’t changed people’s work processes to take advantage of those systems. In fact, I’ve seen places where it seems like the systems are adding work to what people have to do to do their job day by day.”
- 3) “You are missing the most important process - Sales & Operations Planning.”

On point 2), one of the great vignettes that we used there to try to get people to realize how far we had to go was the story of Paul’s discussion with a material planner in one of those production units:

When Paul said to her, “How do you order materials?” she said, “Well, there is the PRISM system over there, but I still have my spreadsheets and I still know sort of when it is the right time to buy. But, I can’t trust the recommendations that are coming in from the computer system, and what they’ve done is taken away my ability to write a purchase order manually and turn it into the Purchasing department. I need a procurement recommendation to come out of this system.” He said, “Why don’t you trust the recommendation?” She said, “Well, I know the inventories that are in there aren’t correct. I know the plan that is feeding it isn’t any good. So I just have to go by my spreadsheet.” He said, “Well, what do you do to place an order.” She said, “I go into the system. I change the safety stock parameter for that material. I put a big number in the safety stock column so that the system says ‘Oh, it’s time to order!’. Then I can say yes to the order, and then I go back in and reduce the safety stock to what it was supposed to be before. But now I’ve used the system to place an order.”

We used that to describe to the top executives to illustrate that the system that you thought was going to give all these benefits is not helping that person to do her job now. We have a long ways to go to get to the point where we actually get benefit instead of extra work out of this system.

Paul’s point 3) was that we were missing the most important process out of the whole suite - what MRP II calls “Sales and Operations Planning”, or “S&OP”. He told us that we needed S&OP because that is the way the top management of a business will really ensure we could meet customer demand. The other side benefit from S&OP is that top management would learn enough about what is really going on to give them more incentive, more ownership of driving the change in the way people do their work. So, we passed that on to the top executives. We also said that an important first step would be to educate the executive team about this.

We had a meeting with the CEO and the president in December of that year, when they

were laying out what they were going to do on the agenda for the January meeting of the top management of the company to set the goals for 1996. When we discussed Paul Politte's observations about the need for changing people's work processes, they changed the title of that section of proposed corporate goals from "Materials Management" to "Supply Chain Process", to shift the emphasis from Materials Management *computer systems* to people's *work processes*. So we got time on the agenda for the early-January meeting of the corporate leadership group of 25-30 managers who represent all parts of the whole company. We talked there about what we can do to get this process change effort going. Three actions were agreed coming out of that meeting:

- 1) a commitment that each of those executives was going to get at least a one-day training session on the basics of MRP II, S&OP, and how it should work.
- 2) establishment of an executive sub-team to develop a set of savings targets, on which we would commit to deliver over the next two years.
- 3) establishment of another sub-team that would develop a process vision, to define what our process target was.

We carried out those actions before the next meeting of the leadership group. All the executives attended one-day training on MRPII and S&OP basics by Paul Politte. At the end of the session, one of the executives who had questioned whether this training was the best use of his time made a great statement to the group: "You know, this really makes a lot of sense and I'm glad I came." So we made a key start in getting executive understanding and commitment.

On 2), a subteam chaired by the CFO set out goals for savings in operating costs and working capital, including a commitment to achieve MRPII Class A in all the business units as a true measure that the required changes in work processes had occurred. On 3), we had a team of supply chain people from all the different business units put together a combination of the reengineering ideas that come out of the supply chain reengineering project and the MRP II process concepts. We called that our Supply Chain Process Vision. We met with every one of the business unit leaders and got their buy-in on it. At the spring meeting of the leadership group, they confirmed the commitment to these savings targets and to the implementation of that process vision across all the businesses. This brought us to another level of executive commitment, well beyond what we had when we were doing the reengineering project.

### **MRPII Process Framework**

So we set out to change our ways of managing our businesses following the MRP II process framework. We used the key principles of MRP II:

- formal, disciplined processes,
- one set of numbers,
- the use of S&OP,
- focus on metrics,
- accountability

- “silence is approval” (unless I contact you, be assured I’ll do my part).

All of that is very different from the Rohm and Haas culture described earlier. We were used to informal processes- you called people up to get stuff done. Every business had their own metrics. We didn’t have any common definitions. Accountability was not a strong characteristic. Sales and Operations Planning—to have a business unit director sit and talk about the details every month—would get the reaction, ‘why do I have to do this?’. But we began to change those cultural features.

The CEO asked two of the business directors who were most ready for it to be pilot cases for S&OP. That was in February of 1996. They started trying out this monthly process right away. Then Paul Politte and I ran half-day S&OP education/kickoff sessions with each of the business teams—there were about 15 of them covering the European business teams and North American ones. We spent half a day with them going through Sales and Operations Planning. There were some striking changes in attitude coming out of those meetings. During one session, one of our most sales-oriented business leaders said, “You know, this is big change for us. This is not the way we are used to running our company. But, it really makes sense to get together every month and talk about what are we are planning to sell, does it look like what we are planning makes sense versus what’s been happening, and then talk about how we will ensure that we really have the supply of product to deliver to those sales. You know, I’ve bought into this - we are going to do this.” By September of 1996, we had nine business units running an S&OP process. That was another huge driver in getting the whole organization bought into it. We cascaded down from top executives to all the business team level people, building understanding about the change in the way we were trying to achieve in the way that we manage business.

### **Redesigned Business Models**

We had an excellent flowchart of our reengineered supply chain process when we came out of the project in 1994. It started with orders, but it had a great big gold star over in the corner of the process flowchart that was labeled “business policies and strategies”. When we talked to business units and tried to get them interested in our reengineering design, we always told them, “you really need to start out by thinking about the business you are in and what your strategies are. Decide whether they make sense and then fit this process to that”. Frankly, it never got much attention. In this 1996 timeframe, we started saying to people, “before we go forward with MRP II process development and implementation, you need to rethink your business, making sure that you have a business model that can succeed”.

We used a tool called Quadrant Analysis, which Paul Politte brought us (Figure 12), to facilitate taking a fundamental look at the market offering.

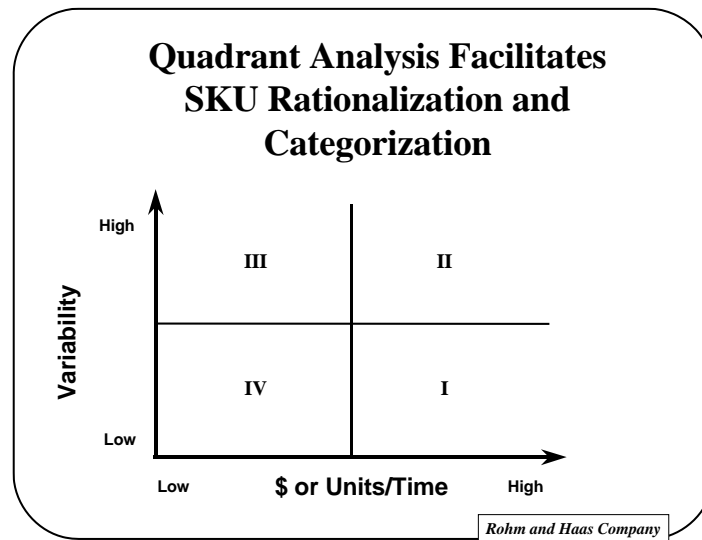


Figure 12

Basically, we compare the average sale of an SKU from a shipping point or production point over time with the variability around that average sale. You use whatever timeframe is right for your business; in most cases, we used a weekly timeframe. So on the bottom axis we had weekly average shipments by SKU. On the upper axis as a measure of variability, we used coefficient of variation. We used a value of 0.5 to define that midpoint line. For most of our businesses, the split on the horizontal line used a truckload a week as a definition of a high -volume, high-demand product and less than a truckload per week as low. You put these into a two by two matrix, so you have come out with four quadrants. When you plot all your SKU data extracted out of the order processing and shipping systems and plot it on here, what you are looking for are the products that lie in Quadrant I - high-volume products, where the demand for them, week by week, is pretty steady. Separate them from the ones that are perhaps high demand but are lumpy demands, so they are harder to plan. Then over on Quadrant III, the upper left, these are going to be highly variable, relatively low-demand products. In Quadrant IV you usually don't find too many, but they are low volume and low variability. One could question why you have them.

We went through this analysis and my group began to generate some data on this. Quickly the idea caught on with people in business units. After seeing some examples, they were interested in having us run their data for them. So, we took SKUs and plotted them on this kind of a chart for almost all our shipping sites. What we found in almost every case is, that we would find about 80% of the volume and about 20% of the SKUs reside in QI or maybe just a little bit above the boundary, on the verge of QII.

Conversely, if you look at QIII (high variability, low volume), we would find 80% of the SKUs, but representing only about 20% of the volume. When we got business people looking at that data they would look at all the SKUs there and the big mass of dots up in QIII and started asking themselves, “Do we really need to have all those SKUs there, all the different packages, all the small volume products? Could we drop those products, or if they are really that critical and important to the customers can we get a specialty price for it that would really make it worthwhile to keep it up there?” So that was the first question - shouldn't we rationalize some of the SKUs?

The next thing we did was chart the inventory for these different quadrants. What you typically found was the absolute dollar value of the inventory for the QIII products was about as big as the dollar value inventory you had for all the big volume QI products. So if you convert that into a days forward coverage (DFC) calculation, we had three to four times as high DFC for products in QIII as what we had for QI. That turned into the question of, “Can I really afford to carry inventory of these small volume, variable products? If I have to keep them, don't they have to be made-to-order kind of products? Then, what kind of lead times can I manufacture in my plant that would still meet the market needs?”

We also looked at profitability a little bit, but that is less clear, because if your costing systems are like ours, the cost for these small volume and big volume products are all smeared. What you know intuitively, when you start looking at this data, is that your big volume products are subsidizing greatly the costs of the small volume products. So this got the business units really thinking. It got them owning the questions for themselves whereas before we were the ones asking them why they had so many SKU's, shouldn't some be MTO, what are your lead times, etc. They made some policy decisions. We got firm lead time policies, whereas before we either didn't have any or, if they were written down, nobody followed them. Now the salespeople, the customer service reps all know those lead time policies; they live by them. We have educated customers on them. We track the exceptions when customers ask for a faster lead-time than this. We ended up with two days order-to-ship rather than the one day that was in our reengineering design - the second day is for the trucker to make sure that we get a truck there so we ensure that we are going to make the delivery on time. The exceptions to these policies are a little higher than what we'd like. But we think that we are going to be able to manage through them. When we talked to customers about these ideas, such as a more fixed lead time or minimum quantity requirements, we got pushback in some places. But for every major customer that gave pushback, you found another one who said, “You know, this sounds like the way I ought to be trying to manage my business. Can you help me to understand how I could plan better?” So the salespeople in many cases are actually using this now as a new tool; something that they can talk to the customer about to perform a better service. This tool really brought us around to getting the right kind of design for what we want to offer to the marketplace.

### **Phase III Results**

This phase is still not ended, but we have achieved major benefits:

S&OP process- the first point is the accountability shift, a very palpable change in the degree to which the top managers in a business understand the issues and are driving to have the issues be resolved by the organization. We ran an S&OP process across our whole acrylic chain. It was run by a top executive; the supply-accountable representative was the VP in charge of our acrylic monomers business, and all the polymer business VP's were the demand-accountable representatives. We started working off numbers. It only took one meeting with the top executive starting to ask questions about, "Are you really sure you are going to sell that much? Why are your numbers so high for August in Europe when everybody there stops working in August?" People began paying attention to the numbers. They started coming in prepared, and taking it very seriously. We began looking at inventories in the total pipeline of this internal supply, where we ship monomer all over the world from Houston. When we looked at the numbers we said, "Can't we operate with lower days forward coverage?" We set some targets and we started taking a lot of money out of that inventory, working on the business side to improve forecast accuracy at the consuming sites, on better logistics arrangements, and on the overall inventory forward coverage target. The other big thing we did was to take advantage of some selling opportunities in the merchant marketplace which the Monomers business could not have done before. They were always afraid of getting yelled at. If one of the polymer businesses didn't have enough monomer, the monomers people got yelled at. So, they always had a safety cushion, in this pipeline of inventory going out to all of the polymer plants. Well, we got into a couple of situations where there was a major opportunity to sell monomer into the marketplace. We used this meeting to say, "look to see if your forecast numbers are accurate. If you will live by them, we can go sell a lot more. But, we normally wouldn't have unless you are willing to buy into data". They literally polled the executives in the room and had a consensus decision, which said, "we will live by these forecast numbers". As a result, there were several millions of dollars that went right to our bottom line, in at least two different cases in the past two years. So, this dramatic change in the way people manage, focused on understanding the details and making a consensus decision across the business units, has meant really big savings to us.

- We got those redesigned business models, as discussed above. They are more robust, they are clearer for everybody in the organization, for the customers, and for the truckers.

- We achieved major cost savings in purchasing and logistics, just by leveraging the volumes we had and buying from fewer people. Better bidding processes, with deeper analysis and strategic partnering approaches have been a major source of savings for us in the last two years.
  
- Our MRPII Class A projects have put a focus on work process change at all levels, and we are really seeing progress now. It is the most gratifying thing I see. We have people who formerly used workarounds (as described above) to buy materials at a plant, now telling us that they use the system, and they can do in two hours a week all the work which formerly required twenty hours per week. And, they say their inventories are always right, that they don't get any phone calls during the night shift saying that a batch cannot be made because we don't have a raw material. We have schedulers who used to change the schedule five times a day now saying, "These business policies are really making a difference! I live with a two-day fixed schedule, and do my scheduling thinking about 3-4 days out, not about today." The operators out in the shop floor can see a great difference in their work. We actually had an operator tell us a year and a half ago that he didn't like working day shift as well as night shift because, on day shift he had to scramble all the materials for the next batch at the last minute. Why? Because the scheduler was in the office and could come out at any time and say, "change that product you are going to make". On night shift you didn't do that because she wasn't there. Two months ago we went out to talk to that same operator and he said, "Things are stable out here now. We don't have any of those sudden changes. I really like my job a lot better." The scheduler said, "I go home on time now, and I've got a whole lot less stress in my day." So those are the kinds of changes that are really happening now around the use of that system to make people's work easier and better.
  
- Even though the stress and the scrambling has been reduced, we have improved our customer service. On-time delivery is better, and we are measuring it in a more consistent way.
  
- Lastly, we know that we have achieved productivity gains. They are somewhat difficult to quantify, but when you talk to people about the easier way they are doing their work you know that there is a much more productive process in place.

## What did we do well? (Figure 13)

### Phase 3: What We Did Well/Not So Well

#### Well:

- Executive commitment and alignment
- Education
- BU ownership
- Communications
- Business model redesigns
- Assigning goals

#### Not So Well:

- “Commitment with understanding” to Class A
- Still too little time
- Varying priority
- Could always do more
- Not all BU’s
- Limited accountability

Figure 13

- We had really good executive commitment and alignment. If there is any downside, it’s that although they understood S&OP and were involved in it, they didn’t understand the magnitude of the task to get their businesses to Class A by the end of 1998. They didn’t understand how much change that meant down at the level of that scheduler or material planner, or how much work that change process would require.
- Education has received much more attention. Entire business teams went through workshops kicking off these MRP II efforts. They would have the salespeople in along with the production people—mix the two together, so every salesperson in the business has seen it. At many of our plants we have taken everybody in the plant through a half-day education session using a supply chain game which we developed during Phase II. In some cases the plant manager himself has devoted an afternoon every week for a couple of months training groups of the operators in an overview of MRPII. This visibly demonstrates the serious intent that we really are going to change. The downside is that it is still difficult to get enough training time - everybody is busy.
- Business unit ownership is generally very good, but it is still not perfect - some business situations call for differing priorities.
- Communication is much improved, but we realize that you can always communicate more.
- Business model redesign has dramatically changed most businesses, but some businesses still say, “We see your quadrant analysis but we need all those small products in QIII, otherwise we’ll lose all our other sales. We have a unique business situation.
- Goals have been assigned, but we still don’t have a really accountable culture, so



there is not always strict follow-up.

## **OVERALL BENEFITS**

Overall, we have achieved major business benefits. (Figure 14)

### **Overall Benefits - 1993-98**

- Improved Business Results
  - Customer service: to >95%
  - Annual Costs: -\$75 MM
  - Working capital: -\$100 MM
  - Productivity: Up
  - Asset Utilization: Up
  
- Qualitative Benefits
  - Lower stress levels, less chaos
  - Improved metrics and accountability
  - Disciplined flexibility

Figure 14

- The on-time delivery target for Class A is 95% minimum, and many of our business units are there or are very close to getting there. That includes the improvements in some of the other parts of the world where we were pretty poor, especially on an import basis.
  
- The cost savings goals we had from our reengineering project, which translated into those goals that we set in Phase II, were \$75 MM per year annual cost savings and \$100 MM working capital reduction. Those amounted to about 10% of our estimated annual supply chain costs and about 20-25% of our inventories. We achieved those by the end of last year.
  
- Productivity has improved, but we still haven't figured out a good way to measure productivity quantitatively across all these units.
  
- Asset utilization is higher, and we do have some figures on that. But multiple initiatives have contributed to this. We have a world class maintenance/reliability effort going on that ties together very well with the planning and scheduling part of MRP II, and we have a project going on in our Engineering Division to build plants faster and cheaper. Those three initiatives together are contributing to major improvements in return on net assets.

The qualitative benefits include:

- Lower stress levels, as described with that scheduler.
- Much stronger use of metrics. MRP II drives you toward more metrics, the most essential ones being sales forecast accuracy and production versus the plan. If you do these well, inventory will stay under control and customer service will be good.

But we have a whole cascade of metrics below that.

- We see that we can more easily respond flexibly - in a disciplined way - when true exceptions do occur, because the routine processes run well.

## **KEY LESSONS LEARNED**

Management Commitment and Involvement - one can't say enough about these. There is a big difference between saying "I'll sign the appropriation request to buy a computer system" versus saying "I'm going to use this process to manage my business and I want all of you with me." So, you need a lot of persistence. There has to be education before true commitment can be obtained. Establishing challenging goals, and holding managers accountable for achieving them, is also a key to driving behavior change down through the organization.

Balancing business autonomy versus corporate leverage - we have leveraged purchasing of goods and services and gained major savings. Likewise, although it is harder to define there is much to be gained by having standard processes and systems - using one computer system, using a standard process at least at the framework level, being able to move people around from one plant or one business to another, running one set of training programs instead of having ten different ones, etc. We are trying to pick the right spots for that.

Formal project management pays off, but you have to keep the management involved in that. In Phase II, we were in the mode of trying to get gains wherever we could, so it was hard to plot out exactly what the route to success was going to be. In the MRP II implementations of Phase III, with total commitment across the business units to get to Class A, it is a lot easier and more useful to have a formal project drawn out. That is helping us. It especially helps if the business director is reviewing the progress on that every month as part of his S&OP process.

Resources - Finding the right resources is always difficult. There is no perfect answer, except that we learned that having ten people spending ten percent of their time working on this is nowhere near as good as having one person dedicated. So you have to get major blocks of people's time and they have to be good people.

Culture change - Do not underestimate the magnitude of the task. The former way of operating at Rohm and Haas was very different from the new way which we are defining. So it has been a long, difficult effort. When you realize that you are trying to change the way that almost every person in the Company does their job, you must plan a strong, comprehensive effort.

Clear framework for change - We have found that the “checklist” approach which MRPII brings is very helpful to driving change. MRP II comes with a scorecard of about 30 items to rate whether your processes are running well. An outside auditor checks whether you are actually doing it well. About 30 pages of detailed characteristics underneath those 30 items further describe what running well means. When you have a population dominated by engineers and chemists - as we have at Rohm and Haas - people really want to see something concrete. We have observed that it is much more difficult to advance some of our other initiatives that are more conceptual than it is with Class A.

Looking back, it has been a long, hard journey but the payoff has been very gratifying for all of us. We wish we could say that we thought it all in advance, planned it, and it worked according to plan, but we didn't. Hopefully this retrospective will give others some useful guidance in their efforts to improve the performance of their supply chains.