BRIDGING THE MARKETING AND MANUFACTURING GAP IN ADVANCED MANUFACTURING TECHNOLOGY ENVIRONMENTS

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Abstract

Bridging the Marketing and Manufacturing Gap

In Advanced Manufacturing Technology Environments

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Marketing and manufacturing have historically struggled to coexist. Advanced manufacturing technology (AMT) has put new strains on this challenge. This empirical study will examine the amount of decision making role ambiguity between the two disciplines in an AMT environment. The benefit of clarifying decision making roles will be to narrow the marketing manufacturing gap, which in turn will allow organizations to be market driven as well as manufacturing intelligent.

Acknowledgement

I would like to acknowledge the cooperation of the fine people at Nutrite, specifically, Mr. William Fleming and Mr. Michael Dawson. Without their interest and devotion of business people's most valuable asset, namely time, this project would not have been realised. I thank them for their efforts.

I would also like to acknowledge the contribution made by Dr. Ron McTavish. Dr. McTavish was instrumental in the development of this research. He was always available for support and guidance. His contribution helped make my research experience very rewarding. Cheers to you, Ron!

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Objective

In an extremely short period of time, the majority of organizations have undergone tremendous technological changes. This in turn, has changed the role of marketing. Marketing is not the 4 Ps any more. It is much more. In adapting to the changing environment, many organizations are striving to match technology with their business strategies. Companies making huge investments in advanced manufacturing technology (AMT) have created new and exciting challenges for marketing and manufacturing.

This empirical study will examine one organization which has recently invested in AMT with the aim of exposing decision making role ambiguity between marketing and manufacturing which weakens its effectiveness. The case study will expose areas of potential conflict and misunderstanding between the two disciplines due to role ambiguity, and suggest remedies.

We will begin with a review of marketing and manufacturing's challenges to coexist. We will then have a discussion on technology's influence in today's organizations, after which we will develop our methodology: namely, responsibility charting. We will conclude with a discussion of our limitations and implications of our findings.

Literature Review: Marketing/Manufacturing Challenges

Marketing is, and always has been, an evolving discipline. As discussed by Webster (1992), in 1910 marketing had no managerial focus. It was purely a set of social and economic processes. Its roots were involved with how to transport agricultural products to market and how to determine prices. The author continues that this focus remained fairly stable until 1948 when the American Marketing Association defined marketing as "the performance of business activities directed toward, and incident to, the flow of goods and services from producer to consumer or user" (p.2).

In the 1950s and 1960s Marketing Management was more consistently taught and used. Marketing Management used economics, psychology, sociology, and statistics to aid decision making and problem solving. Marketing research gained its prominence at this time by helping to align the 4 Ps with the needs of the market place. With increased pressure for more analytical rigour, marketing branched into specialties such as sales, advertising, promotion, distribution, research, customer service, and pricing.

By the 1980s, a shift away from hierarchical organizations toward more flexible organizational forms was required for faster response, acceleration of technological change and meeting consumer preferences. This trend continues today, only the pace has quickened. This trend has put a strain on marketers and manufacturers.

Our research objectives respond to Frankwick, Ward, Hutt, and Reingen (1994). The authors discuss the fact that a very limited number of empirical studies have been done in an effort to understand the interactions between marketing and other functions during strategic decision making. Further, when strategic decisions cut across functional areas within an organizations, the risk of misunderstanding, conflict, and political effort to influence the decision is high. Their study found that a manager's negative beliefs about a project were replaced with positive ones once role clarity was established. They encourage research into organizational structures required for making effective strategic decisions which effectively integrate marketing, R&D, and manufacturing . Research is also needed to better understand the roles people play during a strategic decision.

To be able to suggest how marketing and manufacturing should be integrated, we must first understand the background of their existing relationship. Crittenden (1992), and Hayes, Wheelwright, and Clark (1988) point out that marketing and manufacturing have struggled to coexist . There has been a large amount of misunderstanding between these two functional areas. Braham (1987) goes as far as describing this struggle as a war between manufacturing and marketing. Crittenden, Gardiner, and Stam (1993) suggest that this struggle is a clue to the fact that marketing and manufacturing are interdependent.

The causes of the inter-functional conflict, as discussed by Crittenden (1992), Frankwick, Ward, Hutt, and Reingen (1994), Hayes, Wheelwright, and Clark (1988), and Shapiro (1977), are deep inside the organizational culture and design. Rewards, evaluation of

performance, physical separation, and basic communication are all contributing to the challenge of inter-functional cooperation and integration. Shapiro (1977) continues by discussing how conflict between manufacturing and marketing is also being caused by the complexity of the environment, and other functions such as Finance, R&D, and Engineering.

In agreement with Haas (1987), McGrath and Hoole (1992) discuss how global competition has put pressure on effective decision making. From design, to purchasing, to production, and marketing, integrative decision making is absolutely necessary. We see how global markets have required marketing and manufacturing synergy. Kanter (1989) and Clark (1989) continue by discussing how fierce competition itself has forced a need for cross-departmental collaboration. Procter & Gamble, Honda, Digital, Alcan, and IBM are working hard to better integrate their organizations. More and more, marketing and manufacturing are being asked to work together. Both functions are critical to an organization's success. However, as discussed by Braham (1987), despite effort to integrate marketing and manufacturing, their struggle to coexist continues.

Part of the responsibility for our existing situation is our education system. Marketers learn wonderful techniques and skills in research, quantitative decision making, the 4 Ps, and consumer behaviour et cetera, and yet have little or no exposure to design management, plant operation, and managing technical innovations. As a result, marketing research often forgets to consider manufacturing implications. In an effort to have a

narrow area of research, or to maintain data integrity, many of today's published articles in reputable academic journals are oversimplified and unusable by today's decision makers.

Consider Wilcox, Howell, Kuzdrall, and Britney (1987) who researched how price should vary according to the quantity purchased. Their results suggest a linear relationship. The more someone buys, the cheaper it is to sell, therefore a larger discount is warranted. Find the variables, plug them in and voila, a linear price schedule. Ask a manufacturing foreman if his costs are less for 25,000 units versus 10,000 units. In many cases the cost would be the same. What if the linear pricing schedule got a huge order that production could not meet without overtime or perhaps stopping production of another product with a higher return on investment? The point is, too often marketers make decisions which will effect manufacturing without considering manufacturing implications, and yet we wonder every day why these two functions misunderstand each other so much. This type of research is academically interesting but not practical for a marketer in today's environment to make pricing decisions based on quantity orders.

Wyner, Benedetti, and Trapp (1984) attempted to estimate the impact of product features, including price, on the number and types of units demanded. Again, their research lacked manufacturing implications. The study assumed that manufacturing was capable of producing products with a variety of features without affecting the cost of production or even considering if it is possible. Their results showed a linear price-demand relationship

which can help marketing strategy on alternative price configurations. This is another example of research which overlooks the need for a marketing manufacturing bridge.

The damage caused by marketing and manufacturing's inability to combine their skill sets is significant. Hutt, Walker, and Frankwick (1995) discuss how shared appreciation of each other's skills will create competitive advantage. Kotabe, Sahay, and Aulakh (1996) report that only 20% of product innovations come from technical push even though they contribute to 80% of commercial successes. Bennett and Cooper (1981) argue that marketing's strategy to listen to the customer and give them what they want, is a hinderance on new innovations. Change the colour of a car, make cellular phones smaller, essentially making slight modifications or extensions to the product has created a short sighted vision. Consumers base what they want on what is familiar. Was it a consumer's wish for goretex, microwaves, or post-it notes? Do consumers really know what they want? Marketing has restricted new product innovation by supporting market pull and not technology push. Bennett and Cooper (1981) continue by suggesting that this has contributed to the fact that manufacturers in North America have become tinkerers rather than bold innovators. The quandary here is discussed by Kiel (1984) and Meredith (1987). Technical innovation without market application is deadly. However, a marketing/manufacturing bridge would provide a means of focusing attention on what the firm does best. The linking of these two functions would create a fertile environment to harness creative innovation of products and manufacturing techniques with superior market value which is key to long term business success.

Marketing has been guilty of overlooking manufacturing as a source of competitive advantage. Manufacturing must be challenged to go beyond the focus of production efficiency. The marketing/manufacturing functions should become a greater organizational competitive advantage. It is time for these two functions to change the course of their relationship.

But how should organizations bridge marketing and manufacturing? Crittenden, Gardiner, and Stam (1993), Duimering, Safayeni, and Purdy (1993), and Braham (1987) all support improving the coordination between marketing and manufacturing. This suggests that there are role ambiguities between marketers and manufacturers. Shapiro (1977) argues that clear corporate policies are required to reduce the level of ambiguity.

Mintzberg (1979b), Daft (1989), Johns (1988) and Ziegenfuss (1982) suggest that there is a need for an "integrator role" in today's leaders, and a requirement for leaders to develop organizational designs to encourage the integration of different functional areas. Bisesi (1983) suggests that good leaders see the whole organization, and must give up some authority by empowering the people who do the job since they know their jobs the best.

Hutt and Speh (1984, 1992) suggest integrating marketing, manufacturing, R&D, and distribution by creating a marketing centre. The composition of the marketing centre is dynamic and contingent on the decision to be made. The authors use a technique called

Responsibility Charting as a tool to determine the composition of the marketing centre. In agreement with Ruekert and Walker (1987), Hutt and Speh continue to develop the idea that marketing personnel are the best suited to be a boundary spanner and coordinator of the marketing centre.

Integrating, coordinating, and empowering, all involve clarifying roles people play. But, is role clarity necessarily a good thing? Kowitz (1980) suggests that in some cases, ambiguity creates a brainstorming effect which can lead to more creative and effective decisions. However, in agreement with Brandstätter, Davis, Stocker-Kreichgauer (1982), Kowitz (1980) states that role stability and low group structure uncertainty makes for the most effective group decision making. Mintzberg (1967) argues that strategic planning requires decision making role clarity. We suggest that there exists decision making role ambiguity between marketing and manufacturing in the majority of organizations. Further, where decision making role ambiguity exists, it reduces an organization's ability to be both market driven and manufacturing intelligent, resulting in diminished effectiveness.

Our empirical study, employing Responsibility Charting, will attempt to explore how marketers and manufactures believe strategic decisions are made. We expect to demonstrate that decision making roles are ambiguous. We will explain how and why this is occurring and suggest methods of strengthening the bridge between the two functions by improving role clarity.

Technology's Influence on Today's Organizations

Ettlie (1988) suggests that we have entered into a period of radical technological change. Technological advances have changed the way most companies do business. Available technology has forced many companies to consider huge investments to reap the rewards of high-tech solutions. Often these investments do not meet their expectations, and implementation is difficult as it usually requires a quantum-leap in the way they do business. The failures of some companies trying to go "high-tech" cause many others to hesitate and take a much more thorough look at the cost/benefit of new technology.

So why do so many successful companies implement high-tech production with disappointing results? Gold (1988) argues that most companies underestimate an appropriate time frame for successful implementation. Caterpillar took two full years before their flexible manufacturing system reached its potential. Gold also states that we tend to overestimate the benefits of high-tech solutions. In agreement with Goss, Pascale, Athos (1993), Gold states that failed AMT programs do not properly evaluate the full impact technology can have on an organization which usually requires a quantum leap in the way we do business. Hayes and Jaikumar (1988) describe the quantum leap as replacing a car with a helicopter; a drastic change in the way to go from "A" to "B". Advanced manufacturing technology requires expertise in all areas of the organization from purchasing raw materials with the proper thresholds, to the machinists who repair the equipment. With these types of challenges, it is easy to see how an organization

which has not fully and strategically evaluated advanced manufacturing technology, can be disappointed with results.

The reasons for considering advanced manufacturing technology are clear, according to Meredith (1987) and Meredith and McTavish (1992). Quicker delivery, greater responsiveness, improved quality, and lowering costs can all be accomplished with the implementation of appropriate technology. All of these improvements not only have manufacturing implications but marketing implications as well. Hayes and Jaikumar (1988) state that American firms investing in AMT have seen a reduction in total production costs of as much as 75%. These technical advantages are extremely exciting to marketers and manufacturers. The authors argue that technology should be used as a sophisticated marketing tool.

Capon and Glazer (1987), Grant, Krishnan, Shani, and Baer (1991) and Clark (1989) stress that a strategic approach is required of any company trying to determine appropriate technology adaptation. The technology under consideration must be consistent with strategic goals (corporate mission, position in industry, geographical limitations), characteristics of product-marketing environment (frequency of changing market requirements, competition, product life cycle), and the available resources (financial, physical, people) of the organization.

But who should evaluate the feasibility of AMT? Hayes and Schmenner (1978) believe

that the more top management delegates key manufacturing decisions to manufacturing specialists, the more likely it is that manufacturing priorities will be different then organizational priorities. Because of the far reaching impact of AMT, it is logical that those who have knowledge about consumers and those who have expertise in production should be combining their talents. Hayes and Jaikumar (1988) discuss how AMT demands interfunctional cooperation between marketers and manufactures. Maidique and Hayes (1984), and Jelinek and Goldhar (1984) point out that the knowledge of the entire organization must be tapped to improve the chances of successful AMT. Noori (1990) states that new technology ought to be accompanied by a more organic structure. Again, it is clear that organizational changes are needed for a successful implementation of AMT. The question becomes: what does the new organic organization look like?

In many cases, once AMT is determined appropriate, many organizations make the mistake of passing the baton. Barton and Kraus (1985) argue that the decision to apply AMT must be marketed internally, not sold. Selling implies a finished product. Marketing has a much wider scope. Meredith (1987) argues "To compete in the future, firms must integrate their functions. Not only must manufacturing learn the realities of marketing and the requirements to serve the true needs of the customer, but marketing must also understand the benefits that manufacturing and technology can offer."(p. 39). The organization has to tap all of its resources, including human resources, throw away the baton, join hands, and start taking steps in the same direction. We believe that organizations employing advanced manufacturing technology, must bridge marketing and

manufacturing for a successful implementation which uses the investment to its full potential.

The potential advantages of advanced manufacturing technology are exciting; the risks can be deadly. Manufacturing, and marketing must become cohesive. As Nichols (1984) states, "smart marketers of the future will be masters of technology and will use technology as a tool.." (p. 35).

Methodology

There exists today a considerable degree of dissatisfaction and controversy about the way that research is performed. Bagozzi (1984) believes that this is in part due to the failure to mould together theory domains with the empirical. Bagozzi discusses how any theory has three components: conceptual meaning, empirical meaning, and spurious meaning. Today's research concentrates on concepts and empirical dimensions, but theory and measurement must be constructed in an imperfect world. There is always a degree of random and systematic error. Our research methodology is designed to better cope with spurious meaning and an imperfect world. Bagozzi puts our thinking together nicely when he states:

"By addressing content and structure of our theories can we make the science and art of marketing less haphazard and more subject to evaluation and control...Rather than playing it safe and hiding behind a well developed theory that is never really tested, or a sophisticated methodology that is applied without sound conceptual groundwork, we should demand of ourselves the best that can be offered in both substance and method. Only then will we push our knowledge to a plane truly reflective of the interplay between theory and data, which is, after all, our only valid window on reality in the marketplace" (p. 27).

Accepting Bagozzi's challenge, we intend to develop sound theory and methodology to

be able to make useful generalizations which will contribute to both academia and the business community.

As advocated by Mintzberg (1970, 1979a) and Bonoma (1985), we will employ a more direct research methodology. We wish to avoid emphasis on only data integrity, and develop our theory in a real world setting. Data does not generate theory, only researchers can do that, the data is one way the developed theory can be objectively supported. In the real world there are many variables functioning and it is therefore not practical to look at a few and assume all else constant. This being said, we will, however, be concerned with data integrity and we aim to collect specific data systematically so that we may expand from the particular to the general.

Building on the work of McCann and Gilmore (1983), we will employ responsibility charting to demonstrate that organizations often have difficulty bridging marketing and manufacturing due to role ambiguity and suggest how to help remedy the situation. Responsibility charting is a technique used by selecting decisions that must be made in an organization, the people involved in the decision, and the roles these people play in the decision making process.

McCann and Gilmore (1983) outline the major steps in using responsibility charting.

1. Defining the decision: The chosen decisions must be concise, and mutually understood by all participants.

2. Defining the actors: The actors must be decision specific. However, potential conflict can be avoided by including certain "borderline" actors since the charting itself will reveal the extent of their role in the decision.

3. Defining the types of participation: Although the types of decision making roles can be developed by the group, it is suggested that the following roles are exhaustive.

Basic Definition of Responsibility Charting Roles

Role	Definition	Symbol
Responsible	Actor takes initiative for developing alternatives, assuring consultation, analyzing situation, and perhaps making initial recommendation. Role ends upon approval of decision.	R
Approve	Actor signs off on or vetoes decision before it is implemented, or chooses from alternatives developed by "R" role.	A
Consult	Actor is consulted or asked for substantive input prior to sign off but has no veto power.	C
Implement	Actor is held accountable for implementation of decision once it is made, including notification of other relevant actors about the decision.	M
Inform	Actor is informed of decision once it is made, but is not necessarily consulted before the decision is approved.	I
No Role	Actor has no role in decision.	X

Roles can, of course, overlap and some individuals may play multiple roles.

4. Data collection: Each participant in the decision is asked to indicate the role each actor plays in a particular decision. A completed response sheet of one participant for one decision would look something like the following.

Decision: Should we acquire a booth at the trade show?

	Respon-sible	Approve	Consult	Imple-ment	Inform	No Role
John		✓				
Betty	✓					
Phil	✓					
Laura						✓
Fred			✓	✓		

5. Data tabulation: The results of all participants are then merged by summing their responses. Each cell will then indicate the degree of agreement that an actor plays a particular role. A summary table for one decision would look something like the following.

Decision: Should we acquire a booth at the trade show?

	Respon-sible	Approve	Consult	Imple-ment	Inform	No Role
John		3				
Betty	2					
Phil	4					
Laura		1	1			3
Fred		1	4	5		

6. Data analysis: The data can be analyzed in a variety of ways. The primary issues are to find the distribution of roles across the actors and the level of consensus among participants. It is also possible to look at the decision sensitive comparison of one participant's response versus the others. For example, what does the president think his roles are concerning a specific decision and how do they compare to the other participants. By analyzing the pattern of responses of each actor across the entire set of decisions, some participants are identified as relatively weak or strong, and overall ambiguity in decision making roles will be accessible.

7. Feedback and consensus: The results are presented to the participants who, having their response sheets, can compare their scoring to the aggregate of the group. The goal is to have the group come to a consensus which clarifies the roles of all participants.

As discussed by McCann and Gilmore (1983), Hutt and Speh (1984, 1992), Galbraith (1977), Gilmore and Nelson (1978), and McCann and Galbraith (1981), responsibility charting has been used for many purposes. It has been employed to facilitate organizational redesign, improve planning, help new executives integrate into an organization, team building and to clarify decision making roles. The technique is useful because it can be readily learned and used and it can capture the complexity and dynamic quality of today's decision making.

McCann and Gilmore (1983) used responsibility charting in a large public "third sector" corporation which was created in the 1970s by the American Congress. Management had identified a problem of overlapping and ambiguous responsibilities. Management also wanted to have improved and more sophisticated long term planning. The data revealed significant role ambiguity between the president, the executive vice-president and the regional operations. The end result in this study was that many of the tensions and sources of conflict were confronted and decision making roles were renegotiated. This particular organization has reused the technique of responsibility charting since its introduction.

Gilmore and Nelson (1978) employed responsibility charting in a correctional facility. They wanted to deal with ambiguity and conflict among roles in a complex organization. The authors praise responsibility charting's ability to capture the richness of interactions that are necessary for an organization to function. The authors described the data collection that took place during a two day management seminar. The participants were three Regional Administrators, three Deputies, ten area managers, three business managers, and appropriate Central Office staff. The result of the project was a dramatic clarification of roles of the regional administrator and area managers. The authors state that the technique proved to be particularly powerful in low face to face communication environments because it generated substantial amounts of data on the perceptions each has of the others. The technique focuses on interdependence rather than on interpersonal issues. As such, responsibility charting is

a powerful tool to establish ground rules at the beginning of new programs or organizational changes.

We have selected responsibility charting because it best suited our goal of exposing role ambiguity between marketing and manufacturing. If role ambiguity and gaps exist, they will be exposed by responsibility charting, and a new organizational posture which encompasses both marketing and manufacturing concerns may be warranted.

The following log of activities performed describes our data collection methodology.

1. Identified industrial organizations in the Montréal area with whom we had a potential inside contact, large enough to have a geographical separation between marketing and manufacturing ,which would potentially consider working with the researchers on this project.

2. Contacted Peerless, Twinpack, Hagen, before finally finding Nutrite who was prepared to cooperate with the researchers.

3. Dr. Ron McTavish and I met with Mr. Michael Moriarty, the Executive VP of Marketing at Nutrite, to explore the "fit" of our research objectives with the goals of their organization. Fortunately, both parties were excited about proceeding with the study.

4. Met with the Executive VP Marketing and the VP Marketing to review our goals via an executive summary of our research and discussed their operating procedures.

5. Met with the VP and Director of Manufacturing in Brockville to review our goals via an executive summary of our research and to discuss their operating procedures. Took a tour of the manufacturing facility to better comprehend their operation.

6. Based on the above meetings, we developed several strategic questions which might be of interest. Suggested the actors who should be involved. Faxed questions and list of participants to VP Marketing and VP and Director of Manufacturing and asked for their feedback.

7. Based on feedback one actor was added, 4 questions were eliminated and several refined. The final agreed upon 9 strategic questions were:

Decision 1: Determining the annual/monthly production schedule of nitric acid.

Decision 2: Estimating the sales demands for nitric acid.

Decision 3: Making changes to nitric acid production quality versus specifications.

Decision 4: Setting price schedules and discounts.

Decision 5: Determining the utilization of the # 3 nitric acid plant management information system.

Decision 6: Responding to nitric acid non-conformity incidence (i.e., customer complaints).

Decision 7: Determining if the new electronic technology should also be implemented in nitric acid plants # 1 and # 2.

Decision 8: Assigning costs to appropriate acid plants.

Decision 9: Analyzing the benefits of ISO 9000 approval for the production of nitric acid.

8. Faxed new list to ensure comfort level with participants and final strategic decisions to be explored.

9. Set meeting with Montréal participants. Explained that our research was to study interfunctional dependencies when making strategic decisions. Reviewed the different roles to ensure that they were understood and accepted. Performed a sample decision (Setting tee times for company golf tournament) so that the participants would understand how to complete the response form. Reviewed the strategic decisions selected and answered any questions to ensure that they were understood. Left each participant with a response sheet (see Appendix 1) as well as an envelope to seal their responses and return to me.

10. Performed step 9 in Brockville with manufacturing participants.

11. Received data.

The Company: Nutrite

Nutrite has been in business since 1961. For a full disclosure of its history, please refer to Appendix 2. It is a manufacturer and distributer of fertilizer and its related products. Its head office (management, marketing, finance, and purchasing) is located in Montréal, Québec; raw material warehousing is situated in Contrecoeur, Québec; the manufacturing site is in Brockville, Ontario, and it has a sales presence in the United States in Allentown, Pennsylvania. They employ 325 people in 3 divisions, with sales over $185 million annually. The fertilizer industry is a high volume, low margin market. Our research focuses on Nutrite's Nitrogen division, specifically, the production of nitric acid at the plant in Brockville. Nitric acid is manufactured as a final product as well as an input for other products downstream.

Nutrite's nitric acid facility is one of the largest in North America. This impressive facility produces 300,000 tons of nitric acid each year. They have 3 acid plants aptly named #1, #2, and #3. The #3 acid plant has the largest capacity. A principal nitric acid client is DuPont Canada. Nutrite has had a very close long term relationship with DuPont who happens to be their neighbour. Nutrite sells a vast quantity of nitric acid to them via a pipeline.

In July 1994, Nutrite suffered a disaster. The #3 acid plant was lost to a fire. Some fast decisions had to be made, as the nitric acid was needed for DuPont as well as for

other downstream products. The #1 and #2 acid plants could not meet demand so Nutrite had to purchase nitric acid to meet their requirements.

The emphasis was to get the #3 acid plant back on line as soon as possible. Nutrite began to construct a state of the art nitric acid plant. The new facility now operates at full capacity. Its new controls are electronic and are controlled by a keyboard in a control room as opposed to a vast series of pneumatic valves throughout plant. The #1 and #2 acid plants continue to operate with the older technology.

This new technology may not be as sophisticated as an automobile robotic assembly plant, but technology is relative to the industry. For the fertilizer industry, this facility is extremely advanced.

We were able to acquire Nutrite's cooperation and interest to allow us to explore the potential decision making role ambiguity between marketing and manufacturing in an AMT environment.

Results

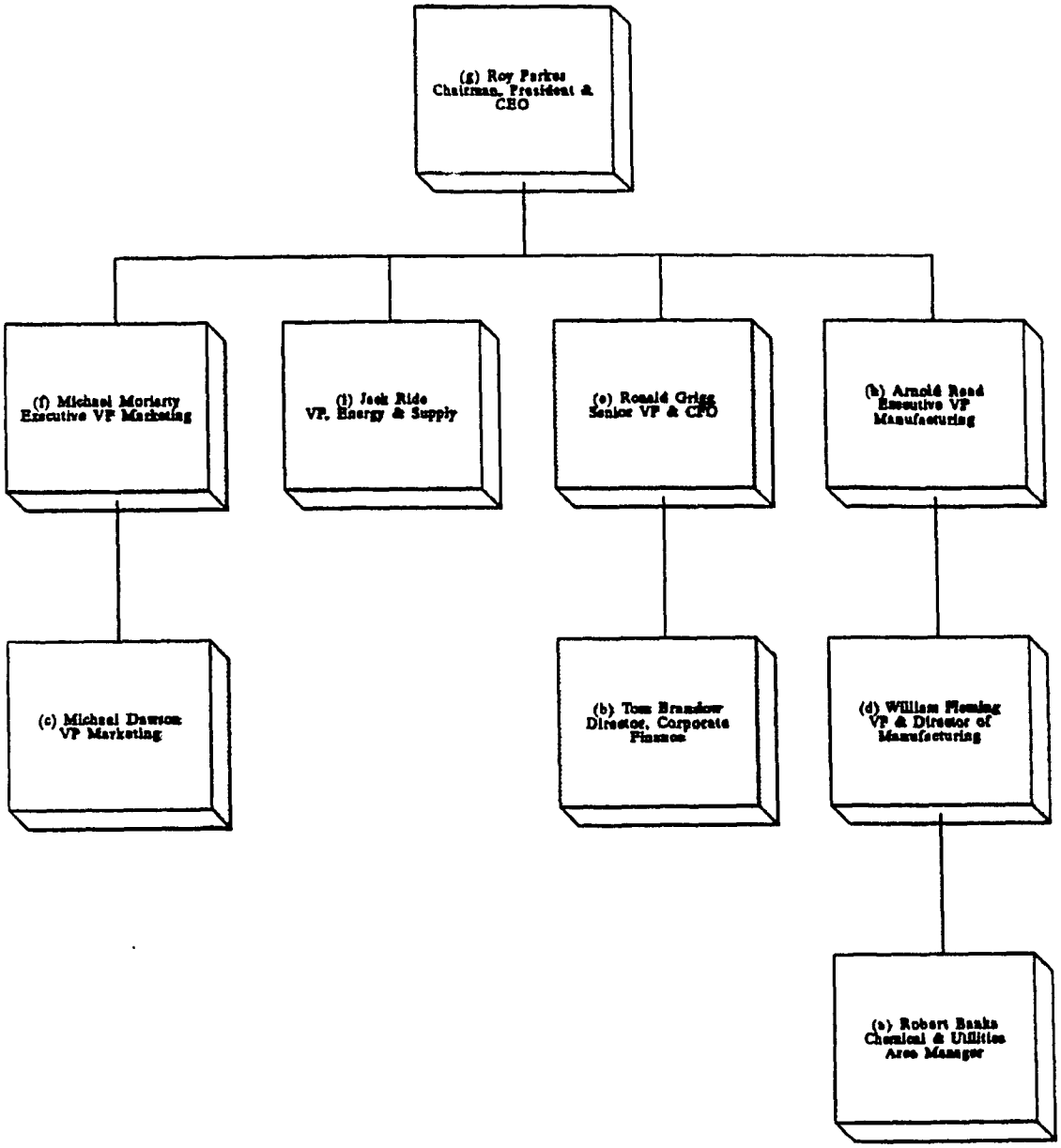
The following decisions were selected because based on an understanding of Nutrite's operation, they require marketing and manufacturing to be involved in some way. Role ambiguity between the two disciplines (if it exists) should be exposed by the questions selected.

Based on our objectives, we will limit our analysis to the responses of the marketing and manufacturing participants. To aid our discussion of the results, you will find at the beginning of this section Nutrite's Organigramme depicting the levels our participants.

What follows is an aggregate from all participants. The result tables (at the end of the discussion of each question) give 2 cells for each role for each participant. The top cell contains the gross number of participants believing that a particular actor plays a particular role. The bottom cell contains the "letters" of the respondent who make up the gross number. In doing so, we can compare the responses of each participant and compare it to the group or other respondents.

A discussion of the implications of our results will be discussed in the following section.

NUTRITE INC.



The letter in front of each name identifies the participant in our result tables.

Decision 1: Determining the annual/monthly production schedule of nitric acid.

1. The Executive VP Manufacturing sees the VP Marketing as the person responsible for this decision, while the VP Marketing believes that VP and Director of Manufacturing is responsible. Two others, the Executive VP Marketing and the Chemical & Utilities Area mangers believe that both manufacturing and marketing are jointly responsible. We see that a monthly/annually strategic decision shows much confusion. We find three schools of thought between marketers and those in manufacturing. We have marketers believing that manufacturers are responsible, manufacturers believing marketing is responsible and finally, a group who believes that it is a joint responsibility between the two functions.

2. Everyone except the Executive VP Manufacturing believes that he approves this decision. However, he believes that the Executive VP Marketing approves this decision. One has to wonder how the annual monthly production schedule of nitric acid is being approved.

3. In terms of consultation we find that marketers believe that both marketers and finance play a role, while manufacturers are very ambiguous. They believe that it is either a joint finance and marketing role, or a pure marketing role, or a pure manufacturing role.

4. It is clear to all that manufacturing implement the decision.

5. Most agree that Finance and CEO are informed of the decision

6. All except the CEO believes that VP Energy & Supply plays no role or is merely informed of this decision. The CEO believes the VP Energy & Supply is consulted before this decision is made.

Decision 1: Determining the annual/monthly production schedule of nitric acid.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	5 *	1	2	7	3	
	abdfg	b	ac	abcefgh	cfi	
(b) Dir. Corp. Fin.	2		6	1	6	
	bi		abcefg	a	cdfghi	
(c) VP Marketing	5	1	5	1	3	
	afghi	a	bcdef	a	cfi	
(d) VP & Dir. Manu.	6	4	2	4	2	
	abcdefg	abdi	ah	adfi	fi	
(e) Sen. VP & CFO			1		5	3
			a		bcdeg	fhi
(f) Exec. VP Marketing		1	2		5	2
		h	di		aefgi	bc
(g) CEO		2	1		7	1
		ag	i		bcdefgi	h
(h) Exec VP Manu.		8	1		2	
		abcdefgi	h		fi	
(i) VP Engy. & Supply			1		3	5
			g		ace	bdfhi

* This cell reads: the 5 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors a,b,d,f,and g.

Decision 2: Estimating the sales demands for nitric acid.

1. Everyone agrees that this is the responsibility of the VP Marketing.

2. All agree that the Executive VP Marketing approves the estimated sales demand.

3. The VP Marketing believes that as the individual responsible for estimating nitric acid sales demand, that he consults finance and manufacturing. The Executive VP Marketing believes that only manufacturing is consulted.

4. At the implementation stage we find confusion. The VP Marketing and the VP and Director of Manufacturing believe that this is a pure marketing role. The Executive VP Manufacturing sees this as a pure manufacturing role. The Executive VP Marketing believes that both manufacturing and marketing play an implementation role.

5. Of interest, in terms of the informing role, the Executive VP Manufacturing believes that manufacturing is only informed about the estimated sales demand. In other words, he is saying, "Tell us how much to make and we'll make it".

6. The Chemical & Utilities Area Manager believes that he and the VP and Director of Manufacturing play no role in the estimation, but the Executive VP Manufacturing represents the manufacturing side as one of the participants in the approval role.

Decision 2: Estimating the sales demands for nitric acid.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr				2*	4	4
				fg	cdfh	abei
(b) Dir. Corp. Fin.	1		6		4	
	h		abcegi		cdfi	
(c) VP Marketing	9			5	2	
	abcdefghi			abcdf	fi	
(d) VP & Dir. Manu.		1	5	3	4	1
		g	cdefi	fhi	bcfi	a
(e) Sen VP & CFO					5	4
					bdefg	achi
(f) Exec. VP Marketing		9		2	2	
		abcdefghi		fi	fi	
(g) CEO		2	3	1	4	
		ad	ghi	i	bcef	
(h) Exec VP Manu.		2	3	2	6	
		ag	dfi	fi	bcefhi	
(i) VP Engy. & Supply		1			2	6
		a			eg	bcdfhi

* This cell reads: the 2 people who believe the Chem. & Utilities Area Mgr implements this decision are actors f and g.

Decision 3: Making changes to nitric acid production quality versus specifications.

1. Marketing sees both manufacturing and marketing jointly responsible for this decision, whereas manufacturing's beliefs are unclear. They either believe the responsible role to be marketing alone or manufacturing alone.

2. The VP Marketing and VP and Director of Manufacturing agree that manufacturing approves this decision. The Executive VP Marketing and the Executive VP Manufacturing both agree that marketing approves changes to nitric acid production quality versus specifications.

3. The Director of Corporate Finance and the Executive VP Marketing have not identified anyone in the consultation role. Five of the remaining 7 respondents identity manufacturing as a function consulted on this decision.

4. Manufacturing believes that they alone implement changes in quality but marketing believes that it is a joint implementation between manufacturing and marketing.

5. Both disciplines are informed.

6. Finance and purchasing clearly have no role in this decision.

Decision 3: Making changes to nitric acid production quality verses specifications.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	3*		3	6	4	
	bfi		ach	bcdegh	acfi	
(b) Dir. Corp. Fin.						9
						abcdefghi
(c) VP Marketing	6	4	2	4	2	
	abcdfg	bfhi	ce	acfi	fi	
(d) VP & Dir. Manu.	5	5	4	3	3	
	cefhi	bcdgi	acdi	afi	afi	
(e) Sen VP & CFO						9
						abcdefghi
(f) Exec. VP Marketing		1	3		4	1
		g	ehi		bcdf	a
(g) CEO			2		3	4
			gi		def	abch
(h) Exec VP Manu.		4	1	1	5	1
		efgi	c	i	bdfhi	a
(i) VP Engy. & Supply						9
						abcdefghi

* This cell reads: the 3 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors b,f, and i.

Decision 4: Setting price schedules and discounts.

1. The VP Marketing is unanimously seen in the role of being responsible.

2. This decision is clearly a marketing approved one. However, the Executive VP believes that he approves while the VP of Marketing believes he approves price schedules and discounts.

3. The CEO, manufacturing, purchasing and finance are consulted by marketing before a decision is taken.

4. The VP Marketing implements.

5. All functions are informed of the decision, although purchasing is weakly represented here.

6. Everyone believes the Chemical & Utilities Area Manager has no role; however, he sees himself to be both consulted and informed on this decision. Many believe that the VP Energy & Supply and the Senior VP & CFO have no role in this decision.

Decision 4: Setting selling price schedules and discounts.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr			1		1	7
			a		a	bcdefgh
(b) Dir. Corp. Fin.			4*		6	
			abcg		cdefhi	
(c) VP Marketing	9	3		7	1	
	abcdefghi	abc		bcdefhi	f	
(d) VP & Dir. Manu.			4		1	5
			acdi		a	befgh
(e) Sen VP & CFO					4	5
					bdef	acghi
(f) Exec. VP Marketing		7	1		4	
		bdefghi	c		acfi	
(g) CEO		1	4		6	
		b	fghi		acdefi	
(h) Exec VP Manu.			2	1	5	2
			bi	i	adegi	ch
(i) VP Engy. & Supply			2		1	6
			bc		a	defghi

* This cell reads: the 4 people who believe the Dir. Corp. Fin. is consulted on this decision are actors a,b,c, and g.

Decision 5: Determining the utilization of the # 3 nitric acid plant management information system.

1. Clearly, manufacturing is responsible; however, marketing says that the VP and Director of Manufacturing is responsible here, but all of the manufacturing side see the Chemical & Utilities Area Manager as the individual in the responsible role.

2. The Executive VP Manufacturing, VP and Director of Manufacturing, and the VP Marketing agree that the VP and Director of Manufacturing approves the decision while the Executive VP Marketing and the Chemical & Utilities Area Manager say the Executive VP Manufacturing approves.

3. The Executive VP Marketing believes that marketing is consulted, but manufacturing clearly does not see marketing as a group to be consulted.

4. The Chemical & Utilities Area Manager implements.

5. The VP Marketing, Senior VP & CFO, Executive VP Marketing, and VP Energy & Supply are widely seen as having no role in the utilization of the MIS.

Decision 5: Determining the utilization of #3 nitric acid plant management information system.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	5*	2	4	7	3	
	abdeh	ab	cfgi	abcdfgh	cfi	
(b) Dir. Corp. Fin.	1		3		5	1
	g		cfh		acefi	b
(c) VP Marketing			3		2	6
			fgi		fi	abcdeh
(d) VP & Dir. Manu.	4	7	2	2	1	
	bcfi	abcdegh	af	fi	f	
(e) Sen VP & CFO					1	8
					g	abcdefhi
(f) Exec. VP Marketing					3	6
					fgi	abcdeh
(g) CEO		2	1		4	4
		ai	i		bcfi	degh
(h) Exec VP Manu.		6	1		4	1
		abefgi	c		cdfi	h
(i) VP Engy. & Supply						9
						abcdefghi

* This cell reads: the 5 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors a,b,d,e,and h.

Decision 6: Responding to nitric acid non-conformity incidence (i.e., customer complaints).

1. VP Marketing and VP and Director of Manufacturing believe they are jointly responsible, while the Executive VP Marketing sees marketing as responsible and the Executive VP Manufacturing sees manufacturing as responsible.

2. Again, the VP Marketing and the VP and Director of Manufacturing believe they jointly approve the decision.

3. The Chemical & Utilities Area Manager is consulted.

4. Once again, the Executive VPs and the VPs disagree. The VP Marketing and VP and Director of Manufacturing believe the Chemical & Utilities Area Manager implements. The Executive VPs Marketing and Manufacturing see the implementation shared by the VP Marketing and VP and Director of Manufacturing. Of interest, while the VPs Marketing and Manufacturing believe the Chemical & Utilities Area Manager is in this role, he sees them as jointly responsible for implementation.

5. The Executive VPs Marketing and Manufacturing and the CEO are informed.

6. Finance and Purchasing play no role.

Decision 6: **Responding to nitric acid non-conformity incidence (i.e., customer complaints).**

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	3*	2	6	3	4	
	abg	ab	acdfhi	bcd	cefi	
(b) Dir. Corp. Fin.			1		2	7
			b		bf	acdeghi
(c) VP Marketing	7	4	1	5	1	
	bcdefgi	bcdh	f	abfhi	f	
(d) VP & Dir. Manu.	5	4	5	3	2	
	acdhi	abcd	aefgi	afh	fi	
(e) Sen VP & CFO					1	8
					f	abcdeghi
(f) Exec. VP Marketing		3	3		5	1
		efi	fgh		bcdfi	a
(g) CEO			1		6	3
			f		befghi	acd
(h) Exec VP Manu.		2	4		6	1
		fi	afgh		bcdfhi	a
(i) VP Engy. & Supply		1			1	8
		f			f	abcdeghi

* This cell reads: the 3 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors a,b,and g.

Decision 7: Determining if the new electronic technology should also be implemented in nitric acid plants # 1 and # 2.

1. The group clearly identifies manufacturing as responsible, but we again see marketing believing that the VP and Director of Manufacturing is the person in this role while the rest of the manufacturing side clearly identify the Chemical & Utilities Area Manager as responsible for this decision.

2. Seven of nine respondents see the Executive VP Manufacturing in the approval role here. The Executive VP Manufacturing, however, identifies the VP and Director of Manufacturing in the approval role; the VP and Director of Manufacturing sees a joint approval by the CEO, Senior VP & CFO, Executive VP Manufacturing and himself.

3. Marketing believes there to be wide consultation (excluding themselves) required for this decision. Manufacturing believes a low level of consultation is required to make this decision. The Executive VP Manufacturing identifies himself and the Director - Corporate Finance in the consulting role; the VP and Director of Manufacturing only picks himself as the required person for consultation; the Chemical & Utilities Area Manager believes both the VP and Director of Manufacturing and himself need to be consulted.

4. The Chemical & Utilities Area Manager implements.

5. The majority see the CEO and the Director - Corporate Finance as being informed.

6. The Executive VP Marketing believes everyone not located at the plant to have no role; the majority remove Marketing as a participant and all remove the VP Energy & Supply as a participant in this decision.

Decision 7: **Determining if new electronic technology should also be implemented in nitric acid plants # 1 and # 2.**

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	4*	2	5	8	3	
	abdh	ab	acefi	abcdfghi	cfi	
(b) Dir. Corp. Fin.			5		5	3
			cefgh		acfgi	bd
(c) VP Marketing					3	5
					beg	acdfh
(d) VP & Dir. Manu.	6	5	3	4	2	
	bcefgi	abdeh	adf	abfi	fi	
(e) Sen VP & CFO		2			2	4
		bd			ch	afgi
(f) Exec. VP Marketing					3	5
					bei	acdfg
(g) CEO		5	1		5	
		abdei	c		cfghi	
(h) Exec VP Manu.		8	3	1	2	
		abcdefgi	cfh	i	fi	
(i) VP Engy. & Supply						9
						abcdefghi

* This cell reads: the 4 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors a,b,d, and h.

Decision 8: Assigning costs to appropriate acid plants.

1. The VP and Director of Manufacturing, the Director - Corporate Finance, and the Chemical & Utilities Area Manager are the individuals responsible for assigning costs. However, the opinions of these individuals are far from a consensus.

2. The VP and Director of Manufacturing approves cost allocation.

3. Marketing, who sees the VP and Director of Manufacturing as responsible here, believes that he consults many individuals at the plant. The VP and Director of Manufacturing and the Executive VP Manufacturing agree that only the latter is consulted.

4. The VP and Director of Manufacturing, the Director - Corporate Finance, and the Chemical & Utilities Area Manager are the individuals responsible for implementation, but again, these individuals are not in agreement.

5. Many are informed.

6. Head office is widely seen as having no role here.

Decision 8: Assigning costs to appropriate acid plants.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	3*	1	6	5	3	
	abd	b	acefgi	abfhi	cfi	
(b) Dir. Corp. Fin.	5	1	3	4	3	
	beghi	b	acf	acdf	cfi	
(c) VP Marketing					4	4
					efhi	abcd
(d) VP & Dir. Manu.	5	8	2	3	2	
	abcfi	abcdeghi	af	afi	fi	
(e) Sen VP & CFO			1		4	5
			f		cefg	abdhi
(f) Exec. VP Marketing					4	5
					efgi	abcdh
(g) CEO		1	2		5	4
		i	fi		cefgi	abdh
(h) Exec VP Manu.		4	5		4	1
		efgi	cdfhi		bcfi	a
(i) VP Engy. & Supply						9
						abcdefghi

* This cell reads: the 3 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors a,b, and d.

Decision 9: Analyzing the benefits of ISO 9000 approval for the production of nitric acid.

1. The VP and Director of Manufacturing and the Executive VP Manufacturing each think each other is responsible for ISO 9000 approval benefit analysis. Marketing sees the Executive VP Manufacturing as responsible. The Chemical & Utilities Area Manager sees a joint marketing and manufacturing responsibility.

2. The Chemical & Utilities Area Manager sees a joint marketing and manufacturing approval. The Executive VP Marketing and the VP and Director of Manufacturing believe the CEO approves, while the Executive VP Manufacturing believes that he approves the decision.

3. Marketing and Manufacturing are consulted.

4. Joint implementation by the VP and Director of Manufacturing and the Chemical & Utilities Area Manager is indicated.

5. Many are informed of this decision.

6. VP Energy & Supply and the Senior VP & CFO are often seen as having no role in the decision.

Decision 9: Analyzing the benefits of ISO 9000 approval for production of nitric acid.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) Chem. & Utilities Area Mgr	3*	2	6	5	3	
	abg	ab	adefhi	abcdh	cfi	
(b) Dir. Corp. Fin.			2		6	
			cg		abdefh	
(c) VP Marketing	1	1	9	1	3	
	a	a	abcdefghi	f	cfi	
(d) VP & Dir. Manu.	5	2	5	4	2	
	abehi	bg	acdfi	acdf	fi	
(e) Sen VP & CFO					5	4
					adefg	bchi
(f) Exec. VP Marketing			2		8	1
			fi		abdefghi	c
(g) CEO		3	1	1	8	
		dfi	c	i	abcefghi	
(h) Exec VP Manu.	4	4	1	1	3	
	cdfi	aegh	b	i	afi	
(i) VP Engy. & Supply					5	4
					abcdf	eghi

* This cell reads: the 3 people who believe the Chem. & Utilities Area Mgr is responsible for this decision are actors a,b, and g.

IMPLICATIONS AND RECOMMENDATIONS

We will now describe the implications of our findings, both in terms of Nutrite's case but also, where possible, for all manufacturers in a similar environment.

Decision 1: Determining the annual/monthly production schedule of nitric acid.

Role ambiguity exists between marketing and manufacturing in making this decision. The group clearly understands that manufacturing implements the production schedule. However, it is unclear who is in the roles of responsible, approval, and consultation when making this strategic decision. This clearly threatens Nutrite's position to effectively establish production schedules of nitric acid.

At the responsible stage, we find much disagreement. Of concern is that some marketers are saying manufacturing is responsible, some manufacturers believe that marketing is responsible, and some marketers and manufacturers believe they are jointly responsible for determining Nutrite's production schedule for nitric acid. The data shows that by default, the VP and Director of Manufacturing plays the role of responsible. The risk is that both the Executive VPs of Manufacturing and Marketing believe that marketing plays a part in developing alternatives, assuring consultation, and analyzing the situation before the production schedule is approved. This risk is reduced by the fact that the VP and Director of Manufacturing consults with the VP of

Marketing. Our recommendation is for Nutrite to clearly assign the VP Marketing and the VP and Director of Manufacturing joint responsibility in determining the production schedules of nitric acid.

At the approval stage, everyone believes that the Executive VP Manufacturing plays this role. Unfortunately, he believes the Executive VP Marketing approves the production schedule. So it is worrisome that production schedules are being implemented despite the fact that it is not clear how they are being approved. Since we have recommended that marketing and manufacturing be jointly responsible for this decision, and manufacturing is clearly the implementer, we believe that manufacturing should have final approval. Nutrite should clearly establish the approval role with the Executive VP Manufacturing.

Our final comment before concluding our discussion of this decision is that while most believe that the VP Energy & Supply plays no role or is merely informed of the decision, it is our recommendation that the purchasing role needs to be augmented to be consulted in the production schedule so that raw materials can be in line with production level goals.

Decision 2: Estimating the sales demands for nitric acid.

We find that marketing is identified as responsible for and approving the estimation of

sales demands, with manufacturing playing a pure consultation role. At the implementation stage we find confusion. To implement estimated sales demands, marketing has to generate sales, and manufacturing has to produce. Beyond that, the benefits of synchronized production and sales are easily understood. Yet with the exception of the Executive VP Marketing, we see marketers widely identified as implementer of sales demands as well as a representation of a belief that manufacturing is the implementer of the estimation of sales demands. The need for improved integration is clear, but for Nutrite, the need remains unsatisfied.

Manufacturers shows some ignorance of the marketing function here. They identify that marketing is responsible for, and approves the decision, but they believe that the CEO needs to be consulted before the decision is made and in some cases, is involved at the approval stage. Marketing says the CEO is only informed of their decision.

Also of interest is the weak representation of purchasing. In fact, two thirds of our respondents felt that the VP Energy & Supply has no role in the estimation of sales demands. One would think that it would be difficult to sell and produce without proper availability of resources.

To improve the implementation of the estimated sales demands, we recommend that Nutrite establish a more integrative posture of marketing and manufacturing. The VP Marketing and the VP and Director of Manufacturing should be joint implementors of

the estimated sales demands. This should improve the level of consultation between the two VPs and improve Nutrite's ability to effectively establish estimated sales demands.

It would be important to again augment the role currently played by the VP Energy & Supply to one of the group consulted before estimated sales demands are approved, so that raw materials will be in sufficient quantity to meet production requirements for the estimated sales.

Decision 3: Making changes to nitric acid production quality versus specifications.

The group agrees that manufacturing is consulted before production quality changes are approved. The group also agrees that finance and purchasing have no role in this decision. Unfortunately, that is where the consensus ends and the role ambiguity begins. Beginning with the role of responsible, marketing identifies that they feel that manufacturing and marketing are jointly responsible. Manufacturing, on the other hand, believes that it is either a manufacturing role or a marketing role, but they do not feel that it is a joint effort. The manufacturers who believe that marketing is responsible, put manufacturing in an approval role and the manufacturers who put manufacturing in the responsible role put marketers in the approval role. Manufacturing shows that it requires both functions to make the decision.

Varying production quality requires the skill set of both functions. Marketers are trying to be jointly responsible for this decision. In fact, marketing expresses a belief that when it comes to making changes to nitric acid quality versus specifications, marketing and manufacturing jointly play the roles of consultation, responsible, approval, and implementation. Manufacturers are less inclined to work jointly with marketing when making this decision. They tend to "pass the baton," whereas marketing plays "rugby." The two sides are on the same team and on the same field, but playing by different rules. This ambiguity must create inconsistent decisions which could lead to conflict and poor decisions.

As an example of this risk, this researcher found out that after the fire at the #3 acid plant, Nutrite had to purchase nitric acid from a third party to meet demand. The purchased product was of a lower quality, as it was yellowish in colour as opposed to clear. Soon after, the manufacturing quality of the #1 and #2 acid plants fell. The manufacturing side changed the product specifications without consultation with marketing. The result was customer complaints. So it would seem that manufacturing feels that they are responsible, approve, and implement production quality without any marketing involvement.

Also of interest here is the fact that nitric acid was described to this researcher as a very generic product. Yet when the purchased product was of poor quality, it would seem that this implies that it is perhaps less generic. However, it was explained that few users of nitric acid care about colour as it usually has no impact in the product's effectiveness. There is one exception. The textile industry often requires clear nitric acid for dying processes. In fact, Nutrite bleaches (at an addition cost to their clients) nitric acid for some textile clients. One of the improvements in the operation of the new high tech #3 acid plant is that it makes clear nitric acid. Marketing is not aware of this fact. Manufacturing discounts the benefit of the superior nitric acid produced in the new plant, even though it has the potential to differentiate itself and sell at improved margins. This is a case in point that marketing and manufacturing are not working towards common goals as well as they should be. It also supports our theory that bridging the marketing and manufacturing gap is required. Manufacturing

intelligence with market savvy would be a powerful combination indeed.

Our recommendation to Nutrite is to fully integrate manufacturing and marketing when making production quality changes to nitric acid. Marketing is ready, and manufacturing must be encouraged to understand the benefit of their combined skill sets. Only then will Nutrite and other organizations in a similar environment be able to benefit and potentially gain significant advantages such as those found in Nutrite's case.

Decision 4: Setting price schedules and discounts.

This decision has the highest level of consensus. Marketing is responsible for, approves, and implements price schedules and discounts. Purchasing, Manufacturing, CEO, and Finance are consulted and informed.

The only confusion surrounds the role of the Chemical & Utilities Area Manager. He feels that he is consulted and informed while 7 of the remaining 8 respondents feel that he has no role in this decision. Nutrite must review with him his important manufacturing responsibilities and demonstrate that he does not need to be involved with this pricing decision.

In a high-volume low-margin market, successful firms will demonstrate strength when

it comes to pricing issues. Indeed, Nutrite performs this decision with little to no confusion.

Decision 5: Determining the Utilization of the # 3 acid plant management information system.

With the new electronic design of the #3 acid plant came the benefit of having a management information system. The system can produce many reports which provide valuable information to the personnel whose responsibility it is to keep the plant running at full capacity for as long as possible. The MIS can, among other things, produce colour graphics to view the plant's operations.

The group clearly agrees that this decision is under the responsibility, approval and implementation of manufacturing. The entire manufacturing side identify the Chemical & Utilities Area Manager as the person responsible, but marketing believes that the VP and Director of Manufacturing is responsible. We will see this pattern on several other questions. This goes to demonstrate that the marketing side has a lack of manufacturing knowledge. Since the manufacturing side is clear, day to day operations will not be hurt by marketing's ignorance of manufacturing. However, the information provided by the #3 acid plant MIS could be used as a marketing tool. When this question was reviewed in Montréal, I had to explain what it was since head office did not even know such a MIS existed. After learning about the existence of

the MIS, the Executive VP Marketing believes that the VP Marketing should be consulted and that he should be informed of this decision.

Manufacturing is not considering the full potential of the new technology. They demonstrate a lack marketing knowledge and see the MIS as only having manufacturing implications. In fact, all manufacturers believe that marketing has no role to play in determining the utilization of the #3 acid plant MIS.

The disadvantage of a marketing manufacturing gap are clearly demonstrated in this decision. If marketers knew the manufacturing capabilities, they could benefit and use their technologies as a marketing tool. We discussed earlier the possibility of Nutrite differentiating their product in a generic marketplace. The #3 acid plant MIS could help them to demonstrate to customers why their production process, and thus their product, is superior to other alternatives.

We recommend that Nutrite take a bold step and make the VP Marketing jointly responsible with the Chemical & Utilities Area Manager for determining the utilization of the MIS.

Organizations operating in a AMT environment needs to put marketers in the plant, and manufacturers in their client's office. If the two sides stretch their boundaries beyond their function, in the end, they will likely learn more about themselves than

they might first expect. Organizational potential will become one step closer to full realization.

Decision 6: Responding to nitric acid non-conformities (i.e., customer complaints).

This question revealed near perfect consensus between the VP Marketing and the VP and Director of Manufacturing. Their thinking is as follows: they are jointly responsible and approve the way a customer complaint is handled. They consult with the Chemical & Utilities Area Manager, and the Chemical and Utilities Area Manager implements their decision. They inform via the Chemical & Utilities Area Manager, the Executive VPs and finance. The CEO and the VP Energy & Supply play no role. Unfortunately, no one else agrees with them.

The most important difference is that at the implementation stage, the Executive VPs and the Chemical & Utilities Area Manager believe that the VP Marketing and the VP and Director of Manufacturing perform this role while they think the Chemical & Utilities Area Manager is implementor. So how is their decision being implemented? And since the implementor is the person who informs everyone of the decision, is all information stopping? How are customer complaints actually being managed? Is it possible that customer complaints sometimes "slip through the cracks"? It would seem that Nutrite is not responding well to customer complaints and in a generic marketplace, loss of market share is certain to occur.

Nutrite needs to clarify implementation roles. We recommend that the VP of Marketing respond with a closed copy to the VP and Director of Manufacturing. This way, both marketers and manufacturers will understand the implications of events leading to a dissatisfied customer.

Decision 7: Determining if the new electronic technology should also be implemented in nitric acid plants # 1 and # 2.

This is another question which reveals role ambiguity between marketing and manufacturing. There is agreement that manufacturing is responsible for, approves, is consulted, and implements this decision. However, marketing is one full managerial level above manufacturing thoughts at the responsible and approval levels. This again reveals marketing's lack of understanding of their manufacturing personnel's roles and abilities.

The new technology is more reliable and improves productivity. It is interesting that both marketing and manufacturing remove marketing as having any role in the decision. One would think that marketing would need to be consulted to ensure the improved efficiency is needed to meet demands and a realistic return on investment could be performed.

Since the marketing implications of existing new technology has never really been

explored, the above finding is, sadly, not surprising. The advanced manufacturing technology has the potential to benefit Nutrite in ways not yet considered.

Our research suggests that organizations often fail to properly analyze the implications of AMT, and that AMT requires a quantum leap in the way a company functions. In Nutrite's case, the implementation of their AMT was done with the main objective to get the #3 acid plant back into operation as soon as possible. We see the evidence of a lack of a full impact study and Nutrite continues, for the most part, to operate as they did before the accident. Is the new technology benefiting Nutrite, or is it another case of a failed implementation of AMT?

We recommend that Nutrite first understand all manufacturing and marketing benefits of the technology in #3 acid plant. We suggest that they assign a performance audit of the #3 acid plant and make the VP and Director of Manufacturing and the VP Marketing jointly responsible for the project. The Executive VP Manufacturing and Marketing, along with the Senior VP & CFO, should approve their audit. Only then will they be in a position to make this strategic decision.

Decision 8: Assigning costs to appropriate acid plants.

Marketing feels that they have no role, or are among those informed, when it comes to assigning costs to acid plants, and manufacturing agrees. What we do find here is that

marketing has a low level of consensus with the manufacturing side, which continues to show their poor understanding of the manufacturing environment.

Of importance here is an example of deep rooted differences between the two functions. Manufacturing is evaluated on their production efficiency. Cost per unit continues to be a measure of their performance. At one meeting in preparation for this study, cost allocation was clearly a preoccupation. "Whose cost is that?", Which plant gets billed for...?", "Which area pays for this maintenance?", and others similar phases were heard throughout our visit. Nutrite needs to review if the manufacturing cost per unit should continue to be the only method of evaluating the manufacturing group. Perhaps they could also consider expecting manufacturing to not only be concerned about costs, but incident reports, AMT full benefit study, synchronizing production with sales, and reporting marketing opportunities to differentiate their product. Manufacturing requires a shift away from their preoccupation with costs towards benefits for Nutrite's clients.

They also need to create a means for marketers to learn more about the manufacturing environment. Perhaps their marketers should work in the plant for a period of time so that they could better understand their coworkers' challenges.

Decision 9: Analyzing the benefits of ISO 9000 approval for the production of nitric acid.

This decision exposes a high level of agreement that both marketing and manufacturing are needed to work together in analyzing ISO 9000 benefits. Marketing plays a mostly consultation role while manufacturing approves, is responsible for and implements the decision.

Manufacturing needs to consider the benefits of involving marketing in more manufacturing decisions. Marketing needs to show a much better interest and must begin learning more from the manufacturing side. We do see several instances of a transition which would instill in the organisation better manufacturing and marketing integration. Nutrite has much work to do, yet they have shown signs of this organizational mutation. Clarifying strategic decision making roles between marketing and manufacturing creates the ability for Nutrite to be market driven and manufacturing intelligent, a powerful ability indeed.

We have demonstrated that there exists strategic decision making role ambiguity between marketing and manufacturing. Further, we have learned that bridging marketing and manufacturing has many interesting benefits. Without a complete understanding of their market, or their manufacturing abilities, our study discovered 2 manufacturing strengths not being exploited by the organization. In particular, we found that when marketing and manufacturing were bridged, the AMT in place provided opportunities for the organization to acquire unique competitive advantages.

Nutrite, and organizations like it, need to adopt an integrative posture. Marketing and manufacturing goals, rewards and evaluations need alignment. Manufacturing and marketing roles in strategic decisions need clarification through discussion and negotiation in a constructive environment. The risk of conflict is real. The risks of not addressing role ambiguity are far worse. If the 9 strategic decisions areas, in our study were ranked in order of importance for reducing marketing and manufacturing decision making role ambiguity, I would suggest the following.

Rank	Strategic Decision Area To Improve Role Clarity	Why and How
1	Making changes to production quality versus specification.	Why? High level of ambiguity exists but also admittance of joint involvement. Marketing and manufacturing rely on each other for effective decisions to be taken here. Possibility for successful product innovation high. How? Requires full integration of marketing and manufacturing across all roles.
2	Determining the utilization of manufacturing plant MIS.	Why? Role clarity would be a large step towards marketers learning manufacturing potentials. Smart marketers will use technology as a tool. How? Make marketing and manufacturing jointly responsible.
3	Responding to customer complaints.	Why? Mistakes will happen. How a company deals with errors can be the difference between success and failure. For marketing and manufacturing to understand the consequences of events contributing to a customer complaint will benefit their common goals. How? Make marketing and manufacturing jointly responsible, marketing to implement, manufacturing to be informed.
4	Assigning manufacturing cost to appropriate plants.	Why? Goes to deal with deep rooted inconsistencies between the rewards and evaluations of marketing and manufacturing. Alignment of manufacturing and marketing goals, rewards, and evaluation narrows the gap between the two functions. How? Create joint goals and reward system between marketing and manufacturing to enlighten their interdependence.

5	Determining if new manufacturing technology should be implemented.	Why? AMT implementations cost huge dollars and fail too often. Proper impact analysis involving both manufacturing and marketing will not only improve marketing's manufacturing knowledge but also lead to more successful decisions. How? Make marketing and manufacturing jointly responsible
6	Determining monthly/annual production schedules.	Why? Marketers think manufacturers are responsible and vice-versa. Integrated skill set of both disciplines is required for effective decision making. How? Make marketing and manufacturing jointly responsible and assign approval to manufacturing.
7	Estimating sales demands.	Why? Synchronized sales and production requires marketing and manufacturing to communicate with each other to achieve common goals. Goes to narrow the manufacturing marketing gap. How? Make marketing and manufacturing joint implementors.
8	Setting price schedules and discounts.	Why? Organisations surviving in a high volume, low margin market will most likely be making this decision effectively. How? No changes required.
9	Analyzing benefits of ISO 9000 classification benefits.	Why? Decision making role ambiguity low, recognition of marketing and manufacturing interdependence high. How? No changes required.

By focusing attention on these strategic decision areas, and implementing our recommendations, organizations like Nutrite can improve their effectiveness by combining the skill sets of marketers and manufacturers and will begin to close the marketing manufacturing gap.

Limitations

There are limitations to using responsibility charting. Firstly, it assumes that greater explicitness about the decision making process is desirable. However, in our application, strategic decision making role clarity and explicitness among top management of a $185 million company is warranted.

Secondly, the potential for conflict is high, so the organization must be ready for the technique and an open, trusting, and participative environment must exist. It can be perceived as a means of pinning blame or assigning error and responses could be overly offensive or defensive.

Thirdly, the technique requires an understanding of the organization's operations so that strategic questions can be developed. Several preparation meetings are required to ensure that all the decisions are relevant and clear, and that all the potential actors are included. All actors must then meet and agree on the definitions of the different decision making roles, understand the decisions, and understand how to complete the response sheets. Once this is clear, each actor must spend up to 5 minutes per decision to complete their responses. The technique of responsibility charting is time consuming.

A final limitation of the technique of responsibility charting is that the data itself can

limit the degree of sophisticated statistical treatment; however it captures the richness of functional interdependence and the application of responsibility charting remains interesting and relatively unexplored.

In terms of our study, there were two complications during the data collection process. The first was that the CEO was not available for the meeting in Montréal because he was away on holidays. He filled out his response sheet 10 days later without my review, but did receive instructions internally. The second was that one respondent in Brockville responded with only his own roles indicated. I faxed the response sheet to him and asked that he redo the exercise and return by fax. In both cases I cannot assure that other discussions after the initial data collection did not influence their final data.

The level of generalizability provided by the technique is limited to an organization in a similar environment to the one under study. In our case, Nutrite is similar to many manufacturers. The head office and the manufacturing facility are geographically separated, AMT implementations are widespread, they operate in a high volume - low margin market, and marketing and manufacturing struggle to coexist. Therefore, our results can be meaningful to many organizations.

Conclusion

Our study dove into unexplored waters The marketing/manufacturing struggle to coexist has frustrate d researchers and business people for far too long. We have identified that at a strategic level, marketing and manufacturing work everyday with different beliefs about who plays what role in a decision. This role ambiguity weakens an organization's ability to be simultaneously manufacturing intelligent and market driven. By focusing attention on clarifying the strategic decision making roles, organizations can begin to close the marketing manufacturing gap. When this is done, organizations operating in an advanced manufacturing technology environment can take full advantage of their investment.

We have identified the strategic decision areas for organizations to address. We have explained why these areas need their attention and have given the key roles to clarify. Clarifying the decision making roles alone will not close the marketing manufacturing gap, but it will present marketers and manufacturers an opportunity to begin a new relationship. All relationships require effort and cooperation, but if successful, the power of the combined skill sets of marketing and manufacturing will contribute to an organization's ability to optimise its success.

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Appendix 1 : Data Response Sheet

Nutrite: A Case Study

Data Response Form

February 29, 1996

Participant: Mr. Roy Parkes

DATA SHEET

Participants

(a) Bob Banks: Chemical & Utilities Area Manager

(b) Tom Brandow: Director - Corporate Finance

(c) Mike Dawson: Vice President Marketing, Nitrogen Division

(d) Bill Fleming: Vice President and Director of Manufacturing

(e) Ronald Grigg: Senior Vice President & Chief Financial Officer

(f) Michael Moriarty: Executive Vice President

(g) Roy Parkes: Chairman, President & Chief Executive Officer

(h) Arnold Read: Executive Vice President

(i) Jack Ride: Vice President - Energy & Supply

Level of Participation

Role	Definition
Responsible	Actor takes initiative for developing alternatives, assuring consultation, analyzing situation, and perhaps making initial recommendation. Role ends upon approval of decision.
Approve	Actor signs off on or vetoes decision before it is implemented, or chooses from alternatives developed by "Responsible" role.
Consult	Actor is consulted or asked for substantive input prior to sign off but has no veto power.
Implement	Actor is held accountable for implementation of decision once it is made, including notification of other relevant actors about the decision.
Inform	Actor is informed of decision once it is made, but is not necessarily consulted before the decision is approved.
No Role	Actor has no role in decision.

Roles can overlap and some individuals may play multiple roles.

Sample Decision: Setting the tee times for company golf tournament .

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) R. Banks						
(b) T. Brandow						
(c) M. Dawson						
(d) B. Fleming						
(e) R. Grigg						
(f) M. Moriarty						
(g) R. Parkes						
(h) A. Read						
(i) J. Ride						

Decision 1: Determining the annual/monthly production schedule of nitric acid.

	Responsible	Approve	Consult	Implement	Inform	No Role
(a) R. Banks						
(b) T. Brandow						
(c) M. Dawson						
(d) B. Fleming						
(e) R. Grigg						
(f) M. Moriarty						
(g) R. Parkes						
(h) A. Read						
(i) J. Ride						

Each of the following strategic question had a table as on the previous page for each respondent to complete.

Decision 2: Estimating the sales demands for nitric acid.

Decision 3: Making changes to nitric acid production quality versus specifications.

Decision 4: Setting price schedules and discounts.

Decision 5: Determining the utilization of the # 3 nitric acid plant management information system.

Decision 6: Responding to nitric acid non-conformity incidence (i.e., customer complaints).

Decision 7: Determining if the new electronic technology should also be implemented in nitric acid plants # 1 and # 2.

Decision 8: Assigning costs to appropriate acid plants.

Decision 9: Analyzing the benefits of ISO 9000 approval for the production of nitric acid.

Appendix 2: Nutrite's History

What is now known as Nutrite, Nitrogen Division, began as a company called Brockville Chemicals in 1961 which was a producer of nitrogen. Most fertilizers are comprised of potash, phosphate, and nitrogen, the latter being the most recent manufactured component. Potash is mined and superphosphate began to be manufactured in 1842.

In the early days, the nitrogen component in fertiliser was in a very low content as it could only be found as sodium nitrate in South America. Due to the high shipping costs to get sodium nitrate to North America, substitutes such as bird droppings, fish wastes, and in some cases back in the 1800s, human wastes were used.

Norwegian scientists began to devise ways to draw nitrogen from the atmosphere by an electric arc to form oxides of nitrogen which would be absorbed in water to form nitric acid. This process requires an abundance of electricity and the founding company, Norsk Hydro, is now one of the largest fertilizer companies in the world.

In 1910, German scientists patented a method of producing synthetic ammonia which could be broken down into ammonium nitrate and urea by means of heat and pressure. Synthetic ammonia was first produced to obtain nitrates for explosives. Ammonium nitrate was first used as a fertilizer in Canada in 1944.

The location in Brockville was chosen due to a long term business agreement with Nutrite's neighbour, DuPont, as well as its proximity to some raw materials. The DuPont Chemical plant produces chemicals to manufacture nylon. Their required raw materials include hydrogen, nitrogen, ammonia and nitric acid. An ammonia plant produces all of these materials. Existing somewhat symbiotically, Nutrite and DuPont are linked by a pipeline. Additional long term contracts were established with the largest manufacturer of mixed fertilizers in Eastern Canada, Canada Packers, as well as what would become Agway in the United States.

The initial capacity of Brockville Chemicals per annum was 860 million cubic feet of hydrogen, 70,000 tons of ammonia, 60,000 tones of nitric acid, and 55,000 tons of nitrogen solution.

The demand for ammonia in the mid 1960s was significant. With solid business sense, Brockville Chemicals noticed that many competitive organizations were increasing their production capacities to meet the demand. Brockville Chemicals forecasted a market excess of ammonia and instead of increasing their production capacity of ammonia, they increased their capacity for the production of nitric acid and constructed a urea plant. They would rely on other manufacturers for their surplus needs of ammonia for their downstream products.

The industry developed into 2 distinct markets, basic fertilizer ingredients to be sold in bulk, as well a retail distribution. In 1967, Brockville Chemicals acquired Canada Packers and International Fertilizers. One year later, Brockville Chemicals had doubled its employees, and owned facilities to manufacture and distribute 500,000 tons of product. It was at this time that head office was established in Montréal. The company now operated a Chemical Division and a Fertilizer Division.

In 1969 Nutrite became the brand name for their fertilizer sold in bags.

As Brockville Chemicals' growth occurred, so did the growth at most other competitive companies. Supply exceeded demand and prices began to fall. One ton of ammonia sold in 1961 at a price of $85. In spring 1968, a ton of ammonia could only be sold for $50. Brockville Chemicals began downsizing. The industry remained lean for some time but due to increases in demand, by 1974 ammonia prices had increased 400 percent above the 1968 prices.

In 1975 Brockville Chemicals changed its name to Genstar Chemicals to coincide with their parent company changing its name to Genstar in 1970. Genstar Chemicals began to increase its capacities. Ammonium nutrite production grew to 200,000 tons per year and nitric acid production increased to 500 tons per day.

In 1979, Genstar sold 50% of it fertilizer assets to Noranda Mines. Genstar Chemicals continued to operate the chemical plant in Brockville, but the fertilizer operation became known as Nutrite.

In 1981, Genstar Chemicals sold the chemical operations to a new company called Nitrochem. Nitrochem was owned 50% by Genstar and 50% by 4 Genstar executives namely, Roy Parkes, Ronald Grigg, Michael Moriarty, and Arnold Read.

By 1985, Imasco Ltd. came into the picture when they became the controlling shareholder of Genstar. In 1987 Nitrochem purchased Nutrite by acquiring the shares held by Noranda. Finally, in 1993, Nitrochem purchased the 50% shares of Nitrochem held by Imasco Ltd. Twelve years after the four executives began their desire to own and operate the entire organization, it finally came to pass. At this time the entire organization became known as Nutrite Inc.

The ownership story does not end here. In 1995, Hydro Agri North America (HANA) acquired 25% of Nutrite Inc. In January 1996, HANA purchased the remaining 75 % of Nutrite Inc. Incidently, the parent company of HANA is Norsk Hydro mentioned earlier. Norsk Hydro is now the world's largest producer of nitrogen and compound fertilizers.

During all of the ownership changes, the organization performed well. The Brockville chemical operation is one of the largest nitric acid production facilities in North America. It now produces 300,000 tons of nitric acid annually. The company, Nutrite, is now comprised of 325 people working in 3 divisions. Unlike many organizations entering the fertilizer industry, with hard work, intelligence, and dedication, Brockville Chemicals may have changed its name, but it has survived. With continued dedication and commitment Nutrite can build on their solid foundation and achieve new and challenging goals.