



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**AN ANALYSIS OF THE RELATIONSHIP BETWEEN SUPPLY-CHAIN
MANAGEMENT PRACTICES AND NEW PRODUCT DEVELOPMENT TIME: A
CASE OF THE NORTH AMERICAN CONFECTIONERY MANUFACTURERS**

**Dr. Aslihan D. Spaulding, University of Kentucky
Dr. Timothy A. Woods, University of Kentucky**

**Selected Paper prepared for presentation at the Southern Agricultural Economics
Association Annual Meeting, Mobile, Alabama, February 1-5, 2003**

Copyright 2002 by Aslihan D. Spaulding and Timothy A. Woods. All rights reserved. Readers may take verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

INTRODUCTION

Balsmeier and Voisin (1996) defined supply chain management as “a strategy that integrates the various organizations’ objectives in order to increase the efficiency of the entire supply chain”(p.24). By using supply chain management as a strategic variable, firms can have the freedom of not trying to balance the relationship between profitable growth and customer satisfaction. Coordination of efforts through supply chain management will let firms meet customer wants cheaper, faster and better, thereby meeting the desired financial performance. When each functional area works together, companies can increase revenues, control cost, and achieve customer satisfaction.

Today’s manufacturers realize that there is a role for channel partnerships to exploit the synergies. Strategic partnerships let companies work more effectively with a few important suppliers and customers who are willing to share responsibility for, and in the success of, the product.

In order to achieve efficiency and reduce uncertainties related to suppliers, companies undertake several production activities by themselves. However, involvement of buyers and suppliers during the development process can, potentially, allow early detection of mistakes, which correspond to the compatibility of the product to the logistics of supply chain and the true needs of the customer.

Involving both consumers and the suppliers in the development process has advantages, such as faster development and faster time-to-market of the product.

The Integrated Supply-Chain Performance Benchmarking Study of 225 manufacturers, conducted by the consulting firm of Pittiglio, Rabin, Todd, & McGrath, found that “companies

that improve their supply chain can generate savings equal to seven percent of their annual revenues, but most companies instead spend nearly twice that amount on inefficient processes¹.”

The supply chain approach involves individual units operating autonomously, and moving products to the next unit in the chain; supplier, manufacturer, distributor, retailer, and the customer.

According to Copacino (1996) “the great benefit of supply chain management is that when all of the channel members-including suppliers, manufacturers, distributors and customers-behave as if they are part of the same company, they can enhance performance significantly across the board”(p.60).

A 1997 survey of Fortune 1000 companies conducted by Ohio State University revealed that 63 percent of the participants have an established strategic relationship with their suppliers and 54 percent of them have such a relationship with their customers². Establishing a strategic relationship with suppliers by year 2000 was expected by 95 percent of the respondents. Relationships with customers were also expected to be established by the year 2000 for 85 percent of the study participants.

Zahra (1993) examined the association between an established company’s industry and competitive strategy variables and the number and timing of its new product introductions. Zahra especially focused on the association between vertical integration and new product timing. Vertical integration was defined by Zahra as “the extent to which a firm is actively engaged in different stages of the product transformation process.”

In order to achieve efficiency and reduce uncertainties related to suppliers, companies undertake several production activities by themselves. Another reason for using vertical

¹ Allnoch, Allen, (1997), “Efficient Supply Chain Practices Mean Big Savings to Leading Manufacturers”, IIE Solutions, July 1997, p.8.

² Supply-Chain Issues Seen as Critical,(1997), Logistics Management, October 1997, vol.36, no.10, pp.19.

integration is to reduce market-related uncertainties by controlling distribution channels that could be used to facilitate new product introductions. Self-reliance and self efficiency are the results of vertical integration. Early introduction of new products and reduction in risks of failure are also enhanced by use of vertical integration. Zahra warned companies, which use extensive integration, about the danger of creating an “inward” internally focused company. These companies may tend to maximize the benefits of its existing products by copying them across lines of business, which is one of the misconceptions suggested by Gordon et al (1995), that is “it worked once; it will work again.”

Zahra (1993) examined 134 manufacturers in one southern state and found that vertical integration is positively related to the number of new product introductions. However, vertical integration is found to be negatively and significantly related to the timing of new product introductions. One reason for this negative association is given as the bureaucracy created to coordinate the different stages of the product transformation process.

Involvement of buyers and suppliers during the development process can, potentially, allow early detection of mistakes which correspond to the compatibility of the product to the logistics of supply chain and the true needs of the customer.

This study examines the supply-chain management practices of the North American Confectionery manufacturers. Information on the frequency of buyer and supplier involvement within the new product development process, type of development activities which buyers and suppliers are involved in and the trends in buyer-supplier involvement is provided. Types of outsourced activities are documented in this paper as well. The impacts of buyer-supplier involvement and outsourcing on new product development time are also analyzed.

BUYER-SUPLIER INVOLVEMENT

Early involvement of customers has been one of the most commonly cited factors related to product success in the new product development literature. Terms like incorporating the voice of the customer, developing a strong market orientation and doing the up-front homework are all used to describe the involvement of customers in the development process. Although involving customers requires time, development time is ultimately reduced by minimizing the risk of a need for rework.

Gupta and Souder (1998) found that short-cycle time companies are involving their buyers in the development process extensively. Buyer involvement resulted in an early definition and clarification of user needs. This also helped companies to identify problems during the development process so that necessary changes are made before the product launch.

According to Blackwell and Blackwell (1999) supply chain efficiency and, therefore, the survival of the company depend on the consumer, since the consumer is the “captain of the supply chain ship.” The traditional supply-chain is a left-to-right progression of activities, where the consumer stands at the end of the chain. If the consumer is king, why do the manufacturers leave them out of the development process? Instead of focusing on supply chain, Blackwell and Blackwell suggested an old concept with a new name, “demand chain management.” Manufacturers decide what product to produce based on their strengths, experience and resources, and they push the product to the consumer. But, there are instances where the pull strategy works the best. So, it is logical to look at consumer needs and work with them to meet these needs. This is nothing new since the consumer has been the focus of all manufacturing activities. The problem is that consumers have been neglected when it comes to the development process. Instead of involving them with the process from the beginning, some manufacturers prefer to “push” the product. This may work for other industries, but for the confectionery

industry, which is highly competitive, this may be a problematic strategy. With the flood of new product introductions, the manufacturer needs to be more careful. Involving both suppliers and buyers/consumers in the development process not only increases the efficiency of the process but also establishes the strong supply-demand chain management.

Involving both consumer and supplier in the process has advantages, such as faster development and faster time to market the product, most of the time. Every company, involved with the new product development process, heavily depends on the process and the people who make it possible to develop a new product.

If the reason for introducing new products is to satisfy consumers/buyers, what is more logical than involving buyers with the development process?

Petersen (1997) argued that customer and sales force insights are only useful for continuous or incremental product changes.

If a company is heavily involved with new product introductions, it may keep involving buyers with the development process as much as possible. But, there are some cases when the competition is intense and the timing of the introduction is critical, as it is in the confectionery industry, so the firm may want to skip some of the stages of the development process. Buyer involvement will be the first one that gets eliminated, since it is a time-consuming activity. But, at the same time, time to market is found to be faster in companies where the buyer and supplier are included in the development stages of the new product. Early involvement of buyers and suppliers will likely lead to a more successful product.

Handfield et al (1999) stated that “across all world-wide manufacturers, purchased materials account for 50 percent of the cost of goods sold” (p.59). If this is the reality, it is expected that suppliers have an impact on the new product development process in several ways. In fact, suppliers have been found to be helpful in lowering costs, decreasing process and product

development times, and offering alternative solutions according to the Food Processing, 1997 Survey (Kevin 1997). Involvement of suppliers in the development process brings advantages like better and more consistent quality, timely delivery, and reduced cost. Gupta and Souder (1998) found that short-cycle companies involve their suppliers in the development process more than long-cycle companies do.

Ittner and Larcker (1997) stated that supplier involvement provides “early availability of prototypes, increased standardization of parts, enhanced consistency between designs and suppliers’ process capabilities, and reduced engineering changing” (p.14).

Handfield et al (1999) survey results showed that the responding companies have achieved improvements in new product projects when the supplier was involved with the product development process. These respondents with active supplier integration achieved 20 percent improvement in development time, 15 percent improvement in development cost and 10 percent improvement in product manufacturing cost compared to similar projects with no supplier integration.

OUTSOURCING

Outsourcing is seen as dependency on outside resources. However, outsourcing has been the solution to counteract the downsized budget for R&D staffing. The Food Engineering 1998 Manufacturing Survey revealed that the percentage of food companies with less than 100 employees with outsourced engineering activities has been increasing. In 1994, only 25 percent of the respondents were outsourcing, while in 1999, this percentage increased to 32 percent. In the survey in 2000, 31.2 percent of the respondents said that they are outsourcing engineering projects, which represents a slight decrease from 1999.

The R&D Survey of Food Processing in 1997 revealed that 70 percent of R&D departments are outsourcing projects, where 52 percent of the respondents are relying on

ingredient suppliers. Approximately 58 percent of the survey respondents in 1998, and 62 percent in 1999, claimed that they are asking ingredient suppliers for more assistance than they have in past years. In 1998, 19 percent of the respondents said that they are doing more outsourcing compared to 1997.

It is evident that some companies outsource parts of certain projects and others outsource an entire project. The choice of what and when to outsource is a difficult one with new product development. Firms need to examine the benefits and costs of outsourcing of a new product development project.

Outsourcing activities that the firm is not an expert on would bring efficiencies to the development process. The cost of the activity may be lower by letting experts taking care of the activity. However, there are costs of outsourcing as well. There is a risk of exposing the new product idea to outsiders. If the outsourcing is not managed well, due to lack of communication and information flow, activity may be completed slower than planned and this costs a late entry to the market.

Outsourcing new product development to independent firms has been seen as an alternative to traditional methods like in-house product development. Since the development process requires confidentiality, bringing outsiders into the process means that the trust between the company and the supplier must be established and maintained throughout all the stages of the development. In addition to the confidentiality and security, another common concern when outsourcing is that going outside the company means loss of control.

Despite these concerns, Berne (1995) suggested that the long-held belief of conducting product development inside company walls by carefully screened company employees, 'under a shroud of secrecy with no outside assistance', has been thrown out by many producers. He

suggested that the need for speedy development has eliminated the fear of the risk of exposure from using outside assistance.

DATA COLLECTION

Addresses of the confectionery manufacturers were collected from the Thomas Food Industry Register, 1998-1999 edition. Manufacturers were contacted via telephone to identify the name of the person who was in charge of new product development, as well as to confirm their addresses. There were 567 confectionery manufacturers and all of them were sent a copy of the survey. A total of 110 surveys were returned with detailed development profiles on 208 new confectionery products. Statistical tests showed no response bias. The following section reports the findings of this survey, focusing on the buyer-supplier involvement and outsourcing.

DATA ANALYSIS

It is reasonable to expect that larger firms may structure their new product development process differently from smaller firms. These differences were examined as a part of this analysis. Company size in the sample varied from very small, with one or two employees, to more than 10,000 employees. Annual sales levels also varied among respondents. Responses were split evenly between smaller companies (less than \$20 million in sales) and larger companies (more than \$20 million in sales). There were 50 small and 49 large manufacturers, while the size of 11 manufacturers could not be determined. Responding manufacturers introduced 10 new products on average in 1999 and the majority of these products were modifications of existing company products. Large manufacturers introduced 15 new products on average while small manufacturers introduced only 4 new products in 1999.

BUYER-SUPPLIER INVOLVEMENT STRATEGY

According to Table 1, 70 percent of the confectionery manufacturers indicated that suppliers were, at least sometimes, involved with the new product development process, while 83

percent of them involved buyers in the development efforts. Buyers seem to be involved more compared to suppliers. This may be due to the fact that academic and trade literature emphasized importance of consumer and hearing consumer's voice for a long time and supplier involvements is a relatively new issue in the food industry.

Table 1 Degree of Buyer and Supplier Involvement

Degree of Involvement	Buyer Involvement		Supplier Involvement	
	Frequency	Percent	Frequency	Percent
Never	7	6.4	11	10.0
Rarely	8	7.3	19	17.3
Sometimes	39	35.4	43	39.1
Often	29	26.4	26	23.6
Always	23	20.9	8	7.3
not answered	4	3.6	3	2.7

The buyer involvement in the new product development process is a common practice among confectionery manufacturers. Product development, product use, field, market testing and product concept search were the top three activities where buyers were involved the most (Table 2).

Table 2 Activities that Buyers and Suppliers were at least "Sometimes" Involved

Development Activity	Buyer		Supplier	
	Frequency	Percent	Frequency	Percent
Concept Search	38	34.5	23	20.9
Concept Screening	31	28.2	9	8.2
Concept Testing	33	30.0	17	15.4
Business Analysis	25	22.7	11	10.0
Product Development	49	44.5	76	69.1
Product Use, Field, Test Marketing	48	43.6	23	20.9
Commercialization	33	30.0	21	19.1

Involvement of suppliers in the development process is another common practice for confectionery manufacturers since 70 percent of the respondents indicated earlier that suppliers were, at least sometimes, included in their new product development efforts. Those who involved suppliers with the process also said that suppliers were mostly involved during product development (69 percent) followed by concept search (21 percent) and product use, field and test marketing stages (21 percent) (Table 2).

The Supplier Integration Research Project, conducted by Handfield et al (1999), revealed that 23.1 percent of the study participants involved suppliers during the idea generation stage, while 22.3 percent involved suppliers in the preliminary business and technical assessment stage. The product concept development stage had the highest supplier involvement with 37.2 percent whereas the prototype development and test stage had the lowest supplier involvement with 2.5 percent involvement.

According to the 1998 Top 100 R&D survey conducted by Food Processing magazine, 58 percent of the respondents were asking ingredient suppliers for more assistance, while four percent were asking for less assistance (Meyer 1998). The level of assistance sought from suppliers did not change for 35 percent of the respondents.

In 1999 more assistance from suppliers was sought by 62 percent of the survey respondents (Dahm 1999). The same survey conducted in 2000 revealed that 65 percent of the respondents consulted outside suppliers regularly.

The trend in buyer and supplier involvement within the confectionery industry, shown in Table 3, is that the buyers and suppliers are more involved with new product development activities for the 34 percent of the responding manufacturers, while a few manufacturers said that there is a decline in buyer and supplier involvement within their new product development activities.

Table 3 Trend in Buyer and Supplier Involvement Over the last 5 Years

Trend	Buyer		Supplier	
	Frequency	Percent	Frequency	Percent
Declined	6	5.5	5	4.5
Stayed the same	57	51.8	64	58.2
Increased	37	33.6	37	33.7
not answered	10	9.1	4	3.6

If the supplier was involved in the concept search stage, the average time spent on a concept search was 2.2 months whereas manufacturers with no supplier involvement during the concept search spent 2.5 months on the concept search (Table 4). On the other hand, manufacturers spent less than half of a month when the buyer was involved during the concept search stage. Supplier involvement reduced a significant amount of time during the product use testing stage (75 percent) and the commercialization stage (44.4 percent), which is found statistically significant, while it increased the amount of time on the rest of the development stages.

According to Table 4, products introduced by companies who reported that they involved buyers in the development process took seven months to develop. Products with buyer involvement were developed in 15 percent less time compared to those that were developed by companies which did not include buyers in the development process. Buyer involvement reduced the time spent on the concept search stage by 20 percent, on the business analysis stage by 52 percent, and on the product development stage by 12.5 percent. However, all of these differences in time spent on each activity with and without buyer involvement are statistically insignificant.

Table 4 Comparison of Buyer and Supplier Involvement on Development Time

Product Development Stages (months)	Buyer Involved	Buyer Not Involved	Supplier Involved	Supplier Not Involved
Concept Search	2.0	2.5	3.5	1.7
Concept Screening	0.9	0.8	1.5	0.5
Concept Testing	1.1	0.8	1.0	0.9
Business Analysis	1.2	2.5	3.8	0.8
Product Development	2.8	3.2	4.4	2.4
Product Use Testing	1.1	0.9	1.5*	0.7*
Commercialization	2.4	2.0	2.8*	1.8*
Total Development Time	7.0	8.2	8.9	6.8
Number of Products	101	89	61	133
* implies that difference in average time spent on activity is statistically significant.				

Table 4 also shows that products that were introduced by companies who reported that they did not involve suppliers in the development process took almost seven months whereas products that were introduced by companies that involved suppliers took almost nine months, which represents a 31 percent time expansion. Average time spent on product use, field and market testing, and commercialization stages are statistically different between companies with and without supplier involvement.

Impacts of buyer and supplier involvement on new product development time are tested. New products developed by companies who involved buyers took seven months to develop a new product while those without buyer involvement took eight months on average to develop a new product (Table 5). However, this difference is not statistically significant. Manufacturers with supplier involvement introduced new products in almost nine months whereas those without supplier involvement took almost seven months to develop new products. This two months difference in development time is also found not statistically significant.

Table 5 Buyer-Supplier Involvement and Development Time

	Buyer Involvement		Supplier Involvement	
	Involved	Not involved	Involved	Not Involved
Average Development Time (months)	7.0	8.2	8.9	6.8
Standard Deviation	(5.0)	(9.0)	(9.5)	(5.6)
Number Reported	101	89	61	133

OUTSOURCING

Many companies look for outside help when they do not have the necessary skills to do some of the activities within the development process. This can include, for example, packaging, legal assistance, or advertising. When the company cannot provide these services internally they look for outside sources.

The R&D Survey of Food Processing in 1997 revealed that 70 percent of R&D departments are outsourcing projects, whereas 52 percent of the respondents are relying on ingredient suppliers. In 1998 and 1999, 58 percent and 62 percent respectively of the survey respondents claimed that they are asking ingredient suppliers for more assistance than they have in past years. In 1998, 19 percent of the respondents said that they are doing more outsourcing compared to 1997.

Most firms surveyed did not outsource, choosing rather to manage their process with internal resources. More than half of the new products (128 out 208) reported in the sample were introduced without outside assistance. The top three activities outsourced by the confectionery manufacturers were packaging, advertising, and prototype development. Among 110 confectionery manufacturers, 49 of them looked for outside assistance during the new product development process, while 61 of them did not. The majority of new products reported by both small and large manufacturers were developed without outsourcing activities.

Table 6 Activities with Outside Assistance by Company Size

Activity Outsourced	Number of Products Reported ³	
	Small Companies	Large Companies
Idea Generation	4	3
Market Analysis	8	9
Business Analysis	1	1
Technical Analysis	6	10
Financial Analysis	3	1
Legal Analysis	4	6
Prototype Development	9	13
Market Tests	1	16
Packaging	20	26
Distribution	2	6
Advertising	11	17
Other	1	3
Did not hire outside help	55	53

Outside assistance for packaging was hired for 26 new products introduced by large companies and for 20 new products introduced by small companies. The small manufacturers looked for outside assistance for advertising activities for 11 new products while advertising was outsourced for 17 new products introduced by large companies. Out of these 17 new products, four of them were the innovative type, six of them were new to the market and company type, three of them were new lines, three of them were new items, and one of them was a modification. Outsourcing on prototype development was obtained for nine new products from small manufacturers and for 13 new products from large companies. For the market tests, large companies looked for outside help for 16 new products while only one small company employed outside assistance. This difference in outsourcing on market tests is statistically significant. The

³ Outside help was not hired by 20 manufacturers who did not declare their size, while only 2 of them outsourced technical analysis.

business analysis activity is an in-house activity where only two new products were introduced with outside assistance on business analysis.

Firms must balance the need to move quickly with limited internal resources with the quality of the product, but they also may risk exposing a proprietary process.

Employing outside assistance slows down the product development time in this sample (Table 7). New products developed by companies who hired outside assistance took almost 10 months to develop a new product while those without outsourcing took six months on average to develop a new product. This difference is found statistically significant.

Table 7 Outside Assistance and Development Time

Outside Assistance	N	Development Time (months)	Standard Deviation
obtained	75	9.6	9.6
not obtained	119	6.2	4.6

CONCLUSIONS

Outsourcing development activities added 35 percent more time to the development of new confectionery products. This result, which is statistically significant, tells us that manufacturers need to keep development activities in-house as much as possible, if the time is a major strategic element for their operations.

Buyer and supplier involvement is an interesting issue. Involvement of a buyer brings time efficiencies such that it reduces development time by 15 percent, whereas supplier involvement increases development time by 31 percent. However, these differences in development time due to buyer-supplier involvement are not statistically significant. But, it is still a somewhat surprising result since both buyer and supplier involvements were expected to bring time reduction to the development process.

The “customer is king” attitude has been a driving force for many businesses since the early 1980s. With the introduction of supply-chain management practices, the direction of this relationship has started to change such that more emphasis has been given to the relationship

with suppliers and, ultimately, a business-to-business (b2b) concept has emerged. The result on supplier involvement was unexpected in that, based on the literature, supplier involvement was supposed to reduce the development time, not increase it. Supplier involvement, however, can be justified with certain types of projects even if it lengthens development time. Supplier input on certain aspects of product design can provide key insights leading to a much more successful product. While development time is critical in many cases, getting the product right is also essential. The data gathered do not permit an evaluation of product success, and many firms that took additional time to involve their suppliers may have discovered that the benefits of better design outweighed the costs of additional development time.

Including suppliers into the new product development process allows manufacturers to gain information and experience on new ideas and technologies available outside the company. It is suggested by Kessler and Chakrabarti (1996) that suppliers help to identify potential problems up front, they provide extra personnel to shorten the development time, and finally, they provide information on availability of necessary parts so that rework is reduced.

Imai et al (as cited in Brown and Eisenhardt, 1995) associated faster development processes with early and extensive supplier involvement. As is stated earlier, suppliers were involved mostly during the latter stages of the development process. This may imply that supplier involvement later in the process may have a positive impact on reducing development time.

Supplier involvement may not be very effective due to many reasons. There may be a lack of communication or misunderstandings. Existing technologies between the supplier and the manufacturer may not be compatible. There may be a lack of trust due to confidentiality of new product development process. If the manufacturer has a minor share in supplier's total sales, supplier may show a lack of commitment.

The Supplier Integration Project of Handfield et al (1999) pointed out two negative impacts of supplier involvement on technology risk and uncertainty. The first negative impact is due to the fact that involvement with a supplier may have a tendency to lock the buying company into the supplier and its technologies. The second negative impact was due to the missing incentive to innovate when the supplier has an inside track which slows the pace of technological advancement.

The same study also revealed that 45 percent of the study participants were not satisfied with the results of supplier integration efforts, but 70 percent of them had high expectations from this integration in the future. Their results indicated that many companies realized the importance of supplier integration but had not as yet discovered the means to successfully implement it. This seemed to be the case for confectionery manufacturers such that they also agreed that the supplier involvement has been increasing but it did not save any time on the new product development effort. This result may also be due to the fact that supplier involvement is a relatively new concept for manufacturers and the means for efficient supplier involvement has not yet been discovered and adapted.

This study analyzed the findings of a survey on North American confectionery manufacturers. Survey results revealed that there is a buyer-supplier involvement within new product development process, however, buyer and supplier involvement have different impacts on new product development time. There is a need for more research on supplier involvement since it adds more time to the development process. A follow up survey with the manufacturers may help explain the direction of the supplier involvement's impact on development time.

REFERENCES

Allnoch, Allen, (1997), *Efficient Supply Chain Practices Mean Big Savings to Leading Manufacturers*, IIE Solutions, July 1997, pp.8-9.

- Balsmeier, Phillip W. and Wendell J. Voisin, (1996), **A**Supply Chain Management: A Time-Based Strategy@, Industrial Management, September/October 1996, pp.24-27.
- Blackwell, Roger D. and Kristina Blackwell,(1999), The Century of the Consumer: Converting Supply Chains into Demand Chains, Retrieved May 4, 2000, from the World Wide Web: <http://www.manufacturing.net/scl/scmr/fall99.htm>.
- Berne, Steve, (1995), **A**Outsourcing New Product Development@, Prepared Foods, mid-April 1995, pp.31-33.
- Brown, Shona L. and Kathleen M. Eisenhardt, 1995, **A**Product Development: Past Research, Present Findings, and Future Directions@, Academy of Management Review, 1995, vol.20, no.2, pp.343-378.
- Copacino, William C., (1996), **A**Seven Supply-Chain Principles@, Traffic Management, January 1996, p.60.
- Dahm, Lori(1999), The 1999 Top 100 R&D Survey, Retrieved February 9, 2000, from the World Wide Web: http://www.foodprocessing.com/fp899/aug_rd_top100.htm
- Food Processing Magazine, various issues.
- Gordon, Geoffrey L, Douglas J. Ayers, Nessim Hanna and Rick E. Ridnour, (1995), **A**The Product Development Process: Three Misconceptions Which Can Derail Even the **A**Best-Laid@Plans@, Journal of Product and Brand Management, 1995, vol.4, no.1, pp.7-17.
- Gupta, Ashok K. and William E. Souder, (1998), **A**Key Drivers of Reduced Cycle Time@, Research Technology Management, July-August 1998, vol.41, issue :4, pp.38-43.
- Handfield, Robert B., Gary L. Ragatz, Kenneth J. Petersen and Robert M. Monczka, (1999), **A**Involving Suppliers in New Product Development@, California Management Review, Fall 1999, vol. 42, no.1, pp.59-82.

Ittner Christopher D. and David F. Larcker, (1997), Product Development Cycle Time and Organizational Performance, Journal of Marketing Research, February 1997, vol.34, pp.13-23.

Kessler, Eric H. and Alok K. Chakrabarti, (1999), Speeding Up the Pace of New Product Development, Journal of Product Innovation Management, 1999 vol.16, pp.231-247.

Kevin, Kitty, (1997), The 1997 Top 100 R&D Survey, Food Processing, June 1997, pp.65-70.

Petersen, Candace,(1997), Get the Sales Force Involved With New Product Development, Marketing News, Nov 10, 1997, AMA, v.31, n23, pp.15-16.

Supply-Chain Issues Seen as Critical, (1997), Logistics Management, October 1997, vol.36, no.10, pp.19.

Thomas Food Industry Register, 1998-99 edition.

Zahra, Shaker A. (1993), "New product innovation in established companies: associations with industry and strategy variables." Entrepreneurship: Theory and Practice, Winter 1993, vol.18, no.2, pp. 47-69