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A morphology of quick response strategies for the apparel industry

Kincade, Doris May Helsing, Ph.D.

The University of North Carolina at Greensboro, 1988

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A MORPHOLOGY OF QUICK RESPONSE STRATEGIES FOR THE APPAREL INDUSTRY

by

Doris May Helsing Kincade

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
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1988

Approved by

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APPROVAL PAGE

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KINCADE, DORIS MAY HELSING, Ph.D. A Morphology of Quick Response Strategies for the Apparel Industry. (1988). Directed by Dr. Barbara N. Clawson. 201 pp.

The purpose of this study was to obtain demographic information about apparel manufacturers and to correlate this information with their Quick Response operational procedures. A stratified random sample was drawn from the North Carolina apparel manufacturers. The sample which was stratified by size by number of employees and target consumer type. Members of the sample were sent a mailed questionnaire resulting in a 47.5% adjusted return rate.

Principle Components Factor Analysis with Varimax Rotation extracted five factors from the list of Quick Response operational procedures. Analysis of variance was performed to determine the influence of four demographic characteristics on the apparel manufacturer's use of the five Quick Response factors. The five factors were further analyzed with coefficients of correlation to determine the direction and strength of their relationship with the amount of perceived change in the augmented product.

The demographic variables of target consumer, size by number of employees and by annual sales dollars, and the leadership position with the retail customer had significant relationships with the Quick Response factors. This influence accounted for some change in four of the five Quick Response factors. Increased usage of three of the Quick Response factors coincided with increased change in

the product and customer services of an apparel manufacturing company.

The presence of the five factors indicate that Quick Response is a heterogeneous construct. The results of this study reaffirm the concept that the diversity of the industry impacts the Quick Response operational strategies which an apparel manufacturer selects for the competitive positioning of the firm. In addition, these changes in the production or distribution efficiency of a company correspond to changes in the company's augmented product.

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CHAPTER I

INTRODUCTION

Statement of the Problem

The adoption of Quick Response as a business strategy can increase return on investment and recapture market share for U.S. apparel manufacturers, but the majority of surveyed apparel manufactures either are not participating in any Quick Response program or are participating in a limited arena. For more Quick Response linkages to be developed, both supplier and customer must strive to understand the apparel manufacturer, the product, the operational structure, the target consumer, and the retail outlets. The diversity of the U.S. apparel manufacturing business contributes to the complexity of potential linkages and the further need for information about apparel manufacturers and their acceptance or rejection of Quick Response strategies.

Over the past two and a half decades the U.S. apparel industry has slowly lost its position of dominance in the production of apparel. In some apparel categories, domestic production reached a low of less than 50 percent of domestic consumption (American Apparel Manufacturers Association, 1985). To stabilize this eroding market share, the industry has searched for strategies for survival. After the exploration of several different strategies, Quick

Response is being promoted by the textile/apparel trade associations and leaders in the industry as the solution for improving the competitive position of the total fiber/textile/apparel complex.

The Crafted with Pride Council first implemented Quick Response in the industry with several pilot studies which linked segments of the textile/apparel/retail complex. Indications from these studies are that Quick Response is a viable tool for the U.S. apparel manufacturers. The companies participating in the pilot studies regained market share, experienced increase in inventory turn, and realized 100% improvement in return on assets (Cotton, 1986). Yet, the results of the study by Kurt Salmon Associates (KSA) in 1987 show that only 30 to 50% of U.S. apparel manufacturers are participating in any type of Quick Response activities ("Retailers move").

Quick Response requires the building of a partnership between trading entities in the textile/apparel/retail channel. In order to develop such a linkage the partners must understand each other. Information must be known about the apparel manufacturer, the product, the company, and the customers. Even with the demonstrated rewards of Quick Response, less than 50% of the apparel manufacturers are choosing these operational techniques. What characteristics of an apparel manufacturer interact with the selection of Quick Response activity?

Objectives

This study is designed to obtain demographic information about apparel manufacturers and to collect information about their Quick Response operational procedures. The tradition of harboring trade secrets, the diversity of the products, and the volatile nature of the business organizations in apparel manufacturing has resulted in a lack of in-depth data about the apparel industry. The aim of the study is to investigate potential correlations between the demographic information and the Quick Response procedures. This information can be used to develop a morphology to express the structural relationp between Quick Response partners.

Quick Response integrates information and practices from a number of dissimilar disciplines. This study provides the interdisciplinary approach needed to study Quick Response in apparel manufacturing. Information and techniques from textile manufacturing, apparel manufacturing, retailing, marketing, management, and economics are combined in this study.

A very limited amount of general research is available about the assimilation of Quick Response into apparel manufacturing or about the implications of adoption of the concept into the apparel industry. Although several pilot programs have shown the return on dollar value of Quick Response, the concept and the acceptance of Quick Response

are still questioned. The available literature for this study of Quick Response came primarily from industry and trade publications and interviews with industry personnel.

A second feature of this study is the application of quality research techniques. The sample was collected by a stratified random sampling technique. Disproportional sampling in strata was used to assure collection of information about all types of apparel manufacturing operations.

The application of Quick Response to apparel manufacturing is a current industry problem which has had very limited academic research. This study provided the framework for an academic review of this industry situation. The applied research in this study is enhanced by the researcher's experience in both industry and academics and by the unique position of the university placed in the center of an active textile/apparel manufacturing region.

The purpose of this study was (a) to establish through literature, face-to-face interviews, and the questionnaire a morphological definition for the Quick Response strategy, (b) to document with interviews and a mailed questionnaire demographic information about the apparel segment of the textile complex, (c) to examine from data collection and hypotheses testing variables which are perceived as correlates with an apparel manufacturer's implementation of Quick Response, and (d) to identify from these tests changes

in the augmented product which are correlated with the production and distribution changes associated with Quick Response.

Conceptual Framework

In this study, Quick Response is viewed as a product, and the objective is to find the best way to meet the needs of the customers with this new product. Based on marketing management process theory, the best dispensation method for this product is the creation of a fit between the customers in the market place and the characteristics of the product. Levitt, in "Marketing Myopia" (1960), said that corporations must view themselves as customer satisfying organizations and not as product producing businesses.

The definition of a business must be developed in terms of the market and the customer needs, not the product or the capacity for production. To achieve this marketing orientation a business must analyze the market. The process for analysis of market demand and the resulting satisfaction of the identified needs is portrayed by a model adapted from the marketing theories of Levitt (1960), Kotler (1984), and Cravens and Lamb (1986) (see Figure 1).

This model depicts a flow chart which overviews the process of continually monitoring the markets and adjusting the activities of the company to meet the demands found in the market. This model focuses on market analysis and

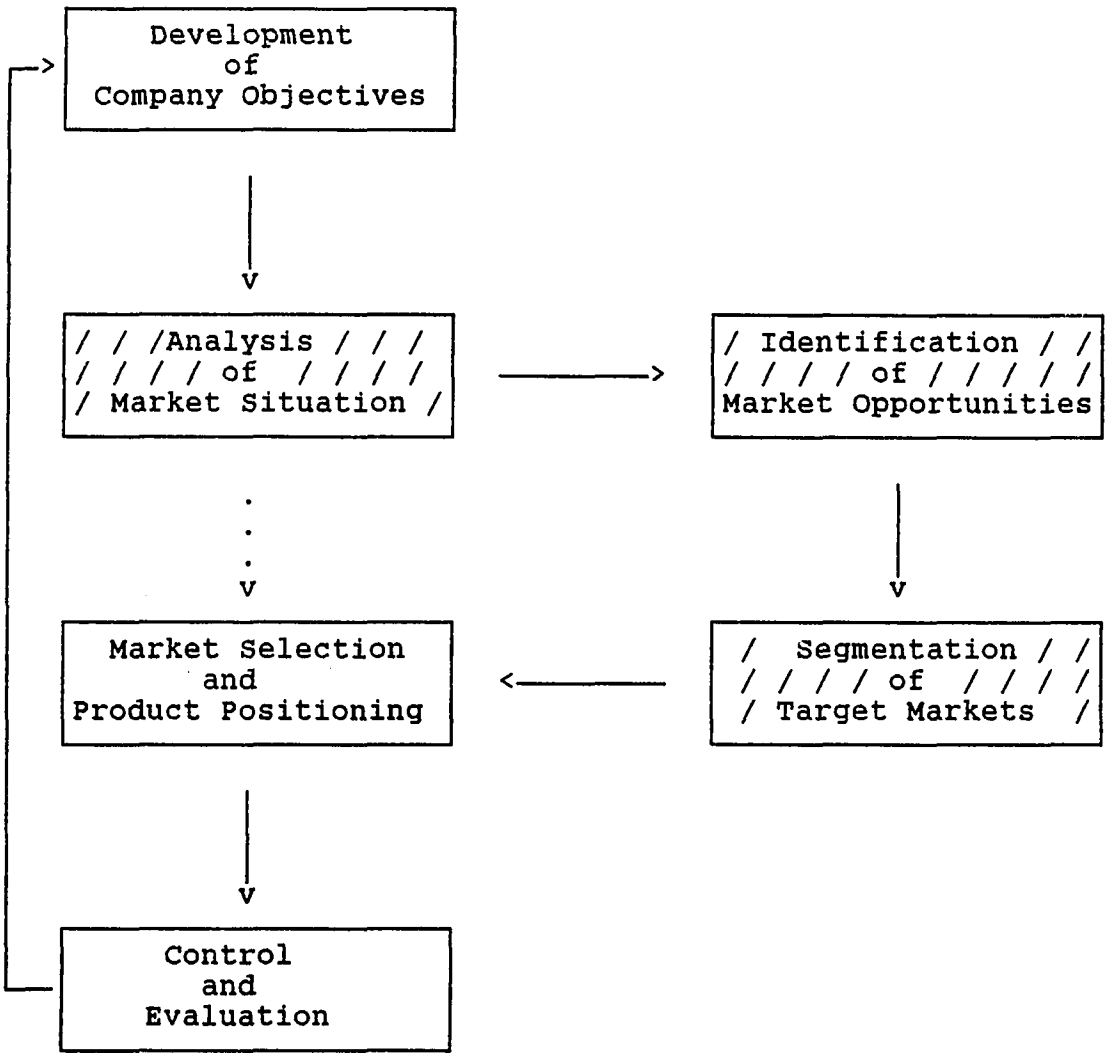

Figure 1. The process for planning and implementing a market reactive organization

integrates the market information into the strategic plans for a corporation. This process crosses both functional and departmental lines within a corporation and involves planning at both the corporate and business levels. The portion of the model tested with this study is shaded in Figure 1.

The model diagramed in Figure 1 contains four basic steps: development of company objectives, analysis of market situation, market selection and product positioning, and control and evaluation. The two phase side extension between Step 2 and Step 3 provides a detailed representation of the process of market analysis. Information gathered from the market analysis coupled with the direction provided by corporate mission and company objectives culminate in the selection of target markets and positioning of products juxtaposed with competition. According to Cravens and Lamb (1986):

> the market target decision is the cutting edge of marketing strategy, service as the basis for setting objectives and developing a positioning strategy. Strategy options range from using a mass strategy to serving one or more subgroups (niches or segments) of customers within a product-market. (p. 13)

Company objectives are the first step in the planning model process. The strategic plan provides the orientation for Step 1 of the model. Cravens and Lamb (1986) describe the strategic planning process as a strategy for a corporation's response to a selected market. A corporate mission must be established, and objectives must be set for

each business unit. According to Levitt (1960), objectives for a business must be stated in terms of satisfying the customer and not as a function of production. Mission statements, objectives, and goals help direct the survival and growth of a corporation (Kotler, 1984).

Analysis of the market involves the scanning of the changing market environment (Kotler, 1984). Observations are made to learn about industry practices and trends, to identify available goods and services, to define generic needs, and to determine characteristics of end users (Cravens and Lamb, 1986). Planning requires the analysis and integration of the information gathered from the markets.

From the market situation analysis, the potential target markets can be identified. This step requires formal research and data collection. "The analytical marketing system is responsible for building models to explain, predict, and/or control marketing processes" (Kotler, 1984, p. 222). Careful segmentation of the market is necessary for the selection of the most profitable markets and for the best positioning to reach the selected segments. Effective market research uses the steps of the scientific method including the formulation and testing of hypotheses. Statistical banks and model formation may enhance the information and aid in target segmentation and selection.

Market selection and product positioning are decisions made using the information gathered from Step 1 and Step 2 of the model. "The market target decision is the choice of which people or organizations toward which a firm will aim its marketing program" (Cravens and Lamb, 1986). Product positioning is used by a corporation to influence the buyer's perception of the product relative to the competitors' offerings.

Control and evaluation is the final step in the model. These items test the implementation of the plans and provide a measure of the results (Kotler, 1984). After collecting and diagnosing the results, adjustments and corrective actions can occur. By measuring the results in relation to the objectives established in step one, the model's loop is closed, and the market analysis cycle has started again.

Market research provides information for the efficient use of the company's resources to develop the right product for the right market. The market may show homogeneous, diffused, or clustered preferences for the product. At the early stages of Quick Response, the industry treated the market as a mass unit with no segmentation. Burlington and other firms offered identical Quick Response packages to all customers (Kasten, 1985). The opinion of this researcher is that the members of the textile/apparel/retail complex are not homogeneous within the levels of the pipeline and that the presentation of the product of Quick Response is best

positioned through different offerings to different market segments. By understanding the needs and characteristics of the segments of the textile/apparel/retail complex, a member of the industry can better serve the customers and achieve the mission of profitable survival and increased growth for the individual manufacturer and for the industry.

Hypotheses

Within the framework of the changing relevant environment for the apparel manufacturer and the diversity of the apparel industry, one questions what variables correlate with an apparel manufacturer's implementation of Quick Response. For segmentation and market targeting, one must know if the apparel manufacturers who use Quick Response are different from these who do not use the Quick Response strategy. As the number of apparel manufacturers implementing Quick Response increases, a second area for questioning arises. Are changes in the augmented product manufactured by apparel companies correlated with the production and distribution changes associated with Quick Response?

The apparel manufacturer is a participant in a complete channel for market delivery, and changes in suppliers or customers can affect the total supply chain. The intent of this study is to ascertain the existence of market segments to receive the product of Quick Response and to question if changes in the production or distribution efficiency of an

apparel manufacturing company correspond to changes in the marketing effectiveness of that company. To study these questions, the following hypotheses are proposed:

1a. The target consumer (men/boys, women/girls, children/infants, and multiple types) of the apparel manufacturer's product has no relationship to the level of Quick Response.

1b. The size of the manufacturing operation as measured by the number of employees and by the annual sales volume has no relationship to the level of Quick Response which an apparel manufacturer has achieved.

1c. The seasonality of the goods as described by the three U.S. Department of Commerce's categories and the fourth industry category has no relationship to the level of Quick Response which an apparel manufacturer has achieved.

1d. The retail customer who purchases the product of the apparel manufacturer and who is described by type, size/ownership, and relationship to supplier has no relationship to the level of Quick Response which that manufacturer has achieved.

2. Implementation of the Quick Response strategy, as measured by the production and distribution techniques of an apparel manufacturer has no corresponding relationship to changes in the product line or customer services offered by the company.

Definitions and Demographics of the Apparel Industry

The fiber/textile/apparel complex includes the total production and flow of goods from the origin of the fiber to the final consumer of the finished end-use product. T. Little (personal communication, 1987), Professor in the Apparel Manufacturing area at North Carolina State University, describes this flow of goods within the total industry channel as the soft goods pipeline. The Office of Technology Assessment in The U.S. Textile and Apparel Industry: A Revolution in Progress (1987) identifies the following major production and marketing steps in the fiber/textile/apparel complex: (a) Fibers are produced through agriculture or synthetic manufacture; (b) fibers are spun, woven, or otherwise constructed and converted to fabric; (c) fabric is converted to apparel products or other industrial products; (d) the completed, end-use, products are then transported, warehoused, and repackaged or assorted to go to retail outlets for distribution to consumer. Each of these previous steps may include coloration of the product and other finishing processes to prepare the product for the next customer or for the final consumer.

A fourth segment, the retail operation, can be added to this complex. Although at each step in the soft goods pipeline, the ultimate consumer is considered as well as

that step's customer, the major focus of this final step is the sale of the garment to the ultimate consumer. The ultimate consumer is the person who will place the garment in use. The retail operations are the immediate channel members and major customers to the apparel industry.

Textile manufacturers are the suppliers to the apparel manufacturers. Textile manufacturers perform the processing steps of converting the fibers into fabrics. The manufacturing processes at this step may include weaving, knitting, felting, and other nonwoven processes. This segment of the industry complex is called the textile industry, but the term, textile industry, is often used, with resulting confusion, to include all manufacturing from fiber through apparel (Office of Technology Assessment, 1987). The end product of this manufacturing step is fabric; however, the Office of Technology Assessment (1987) states that several other terms are used to identify the product.

> 'Fabric' and textile mill products are used interchangeably, and sometimes the term 'textile' is specifically focused on this phase of production. (p. 11)

Size and diversity of apparel manufacturers. Apparel manufacturing includes the steps of sourcing fabric, designing garments, cutting, sewing, finishing, and distribution. Specific data about the apparel industry is elusive and hard to verify. With ease of entry because of low capital investment requirements and limited skill

requirements for laborers, the population of apparel manufacturers tends to stay in a state of flux. The most recent data from the U.S. Bureau of the Census (1987b) and the American Apparel Manufacturers Association (AAMA) (1987a) show the number of apparel manufacturing establishments to be 22,948. The American Textile Manufacturers Institute (ATMI) (1985) in their report Textile and Apparel Imports: A National Concern stated that:

> No other industry in the United States is as widespread and at the same time employs as many people in manufacturing and agriculture as this nation's fiber, textile and apparel industry. (p. 1)

Boswell, the 1986 president of the AAMA, stated that the textile/apparel complex had businesses in all 50 states in 1986.

The number of employees in the apparel industry as reported by ATMI (1987, September) was 1,127,000. The AAMA (1984) in their report expressed the importance of the apparel industry to the U.S. economy:

> The domestic apparel industry is extremely important to the U.S. economy, providing employment for 1.2 million people, of whom almost one million are women. (p. 3)

The U.S. Bureau of the Census (1986) showed that value added by manufacturers in the apparel segment to be $57,578 million which is about 25% percent of the total value added by all manufacturers. The contribution of the apparel segment to the Gross National Product (GNP) was $20 billion.

Retail sales of apparel for October 1987 as reported by Textile World in the "Activity indicators" section (1988) are $7,192 million.

The apparel manufacturing segment of the fiber/textile/apparel complex is composed of many small manufacturers and a few large manufacturers. Liz Claiborne whose sales for 1986 were $813,497,000.00 and NIKE whose apparel division had revenues of $164,600,000.00 for 1986 are representative of the large manufacturers (Benjamin, 1987). In 1986, only 0.1% of the total population of apparel manufacturers were included on Fairchild's list of apparel manufacturers with retail sales over $100 million (Benjamin, 1987). The majority of the business entities in apparel manufacturing are small and are also privately owned; therefore, financial information about these operations is proprietary and often unavailable. In the most recent national census figures, apparel manufacturing businesses with less than 20 employees accounted for 55% of all apparel manufacturing business units (U.S. Bureau of Census, 1984a, 1984b).

These small manufacturing operations may perform some combination, but often not all, of the apparel production processes. Three apparel manufacturing subcategories are identified. They are defined by the Office of Technology Assessment (1987) as follows:

> Manufacturers perform the entire range of operation of garment making. Jobbers are responsible for their own designs, acquire the necessary fabric and related materials, and

> arrange for sale; however, they contract out most production operations, with the exception of cutting. Contractors receive already-cut garment part-bundles from jobbers, and process them into finished garments. (p. 62)

The Standard Industrial Classification (SIC) Codes, issued by the U.S. government, identify the apparel industry according to the type of goods which are produced. Federal and state data are classified by the SIC codes and do not differentiate between the subsegments of manufacturer, jobber, and contractor for the apparel segment. This study included apparel manufacturing which is covered by the SIC codes 231-238 which are shown in Table 1.

Apparel products. Domestic apparel has traditionally been characterized as a stable product with few seasons, slow evolutionary changes, and mass merchandising. Within the past 5 years, the cycle of style changes has rapidly increased in speed. The product families of many manufacturers are now characterized by product line extension, variety in styling, and increase in numbers of product lines. Based on the length of their product life cycle, the product lines for apparel manufacturers have traditionally been divided into three categories, as identified by the Office of Technology Assessment (1987): basic, seasonal, and fashion. Basic products are staple goods and experience little change throughout the year. Seasonal apparel have a product life cycle of approximately

Table 1

Standard Industrial Classification Codes for Apparel

SIC Code	Branch of Industry
2311	Men's, youth's, and boys' suits, coats, and overcoats
2321	Men's, youth's, and boys' night wear and shirts except work shirts
2322	Men's, youth's, and boys' underwear
2323	Men's, youth's, and boys' neckwear
2327	Men's, youth's, and boys' separate trousers
2328	Men's, youth's, and boys' work clothing
2329	Men's, youth's, and boys' clothing not elsewhere classified
2331	Women's, misses', and juniors' blouses, waists, and shirts
2335	Women's, misses', and juniors' dresses
2337	Women's, misses', and juniors' suits, skirts, and coats
2339	Women's, misses', and juniors' outerwear, not elsewhere classified
2341	Women's, misses', children's, and infants' underwear and nightwear
2342	Brassiere, girdles, and allied garments
2361	Girls', children's, and infants' dresses, blouses, waists, and shirts
2363	Girls', children's, and infants' coats and suits
2369	Girls', children's, and infants' outerwear, not elsewhere classified
2384	Robes and dressing gowns
2385	Raincoats and other waterproof outer garments
2389	Apparel and accessories, not elsewhere classified

20 weeks. Fashion goods are expected to have a higher turnover and are considered to be saleable for 10 weeks.

A fourth category of goods, those with a continual turnover is emerging especially in the women's wear market. These goods form a constant flow into the market. Spevack (1987, October 28) states in Daily News Record that "boys' sportswear makers are following the lead of the women's wear market by offering their retail customers more line releases and more frequent deliveries throughout the years" (p. 1). The apparel market is changing rapidly and is dividing into many more pieces. The number of stock keeping units (SKUs) being manufactured and offered for retail sale is rapidly rising (Weller, 1987). The average high fashion goods manufacturer handles 43,200 stock keeping units (SKUs) per year (Kimberlin, 1988).

The fiber/textile/apparel industry is a loosely woven network with limited vertical integration. Within this complex, the apparel manufacturing segment is extremely diverse with large numbers of business entities. These businesses range in size from small units with few employees to major corporations with over 2,500 employees. The apparel products produced represent large numbers of SKUs, rapidly changing trends, increasing numbers of seasons, and limited standardization of styling options. This diversity impacts the strategies which an apparel manufacturer selects for the competitive positioning of the firm.

CHAPTER II

REVIEW OF LITERATURE

By 1973 the apparel industry reached the peak of several decades of positive production growth. Since 1973 the industry has experienced stable or declining production. The review of literature presents the following: (1) historical review of apparel manufacturing for 1958 to 1985, (2) forces which correlate with the decline of the apparel industry, (3) solutions offered for revitalization of the apparel industry, (4) the theories and tools of Quick Response, (5) the influences which impact Quick Response, and (6) the impact of Quick Response on apparel products.

Historical Review of Apparel Manufacturing 1958-1985

In 1960, "almost every garment sold in our (domestic) market was made in the U.S." (AAMA, 1984). This statement represents the state of the apparel industry in 1960 as found by AAMA (1984) in their extensive industry review. This position of market dominance was not to remain despite the general growth of the U.S. economy and the increase in clothing consumption by the U.S. consumer. In the decades to follow 1960, the general U.S. economy grew, and consumer consumption of apparel items increased with apparel retail sales climbing from $20 billion in 1960 to $98 billion in

1983. In the 1960s, the apparel industry also experienced rapid and steady growth, but the parallel growth peaks by the middle of the 1970s.

The changes experienced by the U.S. apparel manufacturers for the 1970s and 1980s have been as rapid and dramatic as for the general economy in amount of change but not as positive in direction of growth. Market share of the growing U.S. consumption of apparel has declined for U.S. apparel manufacturers from the nearly 100% in 1960 to 67% in 1983 (AAMA, 1984). In the 1970s and 1980s, this reduction of market share is mirrored in the reduction of apparel manufacturing establishments, drop in employment, and in the leveling of domestic production of apparel.

Throughout the 1960s, the apparel industry's contribution to the Gross National Product (GNP) in manufacturing increased from $6 billion to $72 billion (U.S. Bureau of Census, 1987). In 1958, 1.17 million people were employed in the apparel industry and the wholesale value of their production was $11.1 billion (AAMA, 1984). During the next 15 years employment continued to expand. The employment level in the apparel industry had reached a record high employment of 1,438,000 workers in 1973, and the value of their production in 1958 dollars had doubled. As shown in Table 2, the first of the 1970s represents the peak for the apparel industry in numbers of workers employed

and establishments formed (U.S. Bureau of Census, 1987a, 1987b, & 1985).

The numbers of units of apparel domestically produced also peaked in the beginning of the 1970s (AAMA, 1987a). From 1973 to 1979, apparel production continued at or below the 1973 level (AAMA, 1984). During this time, employment in apparel manufacturing slowly decreased, and the 25 million jobs which had been created in the 1960s were lost from the apparel industry. In New York City, the center for apparel manufacturing in the 1950s and 1960s, combined employment from the textile and apparel industries was

Table 2

Number of Establishments and Employees for Apparel Manufacturing in SIC 23

Year	Establishments (no.)	Employees (1000)
1985	22,948	1,099
1982	24,391	1,189
1977	26,505	1,334
1972	24,441	1,364
1967	26,393	1,354
1962	N/A	1,233

reduced by half between 1973 and 1985. By 1985, employment in the apparel industry for the entire nation had dropped to the lowest level in 30 years (U.S. Bureau of the Census, 1985, 1987b & AAMA, 1987a). Plant closings and unemployment became problems in many of the traditional, apparel production states (Office of Technology Assessment, 1987).

Contribution of apparel industries to the GNP has remained relatively flat since 1977 (U.S. Bureau of Census, 1987). From 1979 to 1985, apparel production decreased when measured in numbers of units produced (Barner, Berkstresser, Michel, & Williamson, 1985). Reduction of production is especially evident in the garment categories of men's woven sport shirts, men's and women's sweaters, men's suits, and women's dresses (AAMA, 1987a). Domestic production of women's dresses fell from a high of 282.2 million units in 1967 to a low of 152.1 million units in 1985.

Concern for the reduced market share of the apparel industry is evident in Boswell's speech (1986) to the Textile and Needle Trades Division of the American Society for Quality Control (TNT-ASQC). Boswell, the 1986 president of the American Apparel Manufacturers Association, questioned the possibilities for the continued survival of the apparel industry. He indicated that rising apparel imports coupled with no change in the marketing positions of the domestic industry create conditions similar to those that preceded the collapse of the U.S. footwear industry.

In his speech, Boswell expressed concern that by 1990, without intervention, 80% of all apparel consumed in the U.S. will be from foreign sources.

Forces Which Correlate with the Decline of the Apparel Industry

In 1983, AAMA formed a special committee to examine the apparel industry and to determine why the level of apparel production was declining when the consumption of apparel, as represented in retail sales, was increasing. The findings are explained in the report by AAMA (1984), Apparel Manufacturing Strategies. The conclusion of the AAMA report (1984) is that the primary reason for the unemployment and loss of business by the U.S. domestic industry was the rising influx of imports. Changes in operational procedures and equipment also account for a small portion of the unemployment. The report further stated that suppliers and customers to the apparel industry were changing the way they do business.

Competition from imports. The AAMA committee (1984) found that competition from lower cost, imported garments was eroding market share for domestic manufacturers. At the same time that domestic production was decreasing, apparel imports were increasing. Apparel manufacturing has become a global industry, and production of apparel occurs in an diverse number of countries throughout the world, for example, Belgium, Hong Kong, and Mexico (American Textile

Manufacturers Institute, 1987, August). The ATMI (1985) in their study, Textile and Apparel Imports: A National Concern, states that "more than 100 countries ship these goods (apparel and textile) to the U.S" (p. 2).

From 1970 to 1983, American retailers have escalated their sourcing from foreign manufacturers (AAMA, 1984). Barner, Berkstresser, Michel, and Williamson (1985) reported that from 1973 to 1979 apparel imports rose 4% per year, and the level continued to increased 10% per year for the next five years. By 1983 "one out of every four garments sold in the U.S. was made somewhere else" (p. 1), and one-fourth of the total wholesale value of apparel sold in the U.S. was from imported goods. Imports in the categories of sweaters and men's and boys' woven shirts represent more than 50% of domestic consumption. In 1985 imports accounted for approximately 80% of all of the private label garments sold at retail in the U.S. (Cotton, 1986).

Under the Arrangement Regarding International Trade in Textiles which is more commonly known as the Multi-Fiber Agreement (MFA), the U.S. has negotiated bilateral trade agreements with many countries (Office of Technology Assessment, 1987). Importation of apparel into the U.S is governed by these bilateral trade agreements with selected countries. Boswell (1986) states that these imports pose the most threatening challenge the U.S. apparel industry has

ever faced. The situation is set in perspective by the AAMA (1984):

> It (apparel manufacturing) is part of a global market, one which did not exist 25 years ago and which is characterized by a new set of rules and conditions, with new roles for its participants. (p. 1)

Changes in the market place. The apparel market in the U.S. is changing and is demanding corresponding changes from the apparel industry. Portions of the apparel industry did not make rapid changes in the 1970s and early 1980s and continued to market and produce apparel as if in the supplier market of the 1960s. Some of the major problems facing apparel manufacturers are "how to compete with low-cost imports and how to cope with the ever increasing demands of customers--wider style ranges, and shorter delivery requirements" (Benson, 1987, p. 9). "The mass market as we once knew it no longer exists. When it comes to fashion, we gradually have evolved into a more 'individualistic' marketplace" (Less, p. 108). The strength of the consumer demand is seen in the quote by a Vice President at Sears, Roebuck, and Company, the nations largest retailer, "'I think we have to realize that middle America has discovered style in everything from automobiles to clothing [sic]'" (Sharoff, 1987, p. 14). Hinderfeld, chairman of Wingspread Corp, a large diversified apparel company, suggests in the following quote that changes in the U.S. population affect changes in the market place for apparel goods (Kaoli, 1986).

> 'The consumption of apparel in the United States moves with the growth of population and very little else. The number of units of apparel sold yearly, in the last 50 years, has grown between one and one and half percent a year, which tracks the growth of population.' (p. 24)

The market changes and their affect on the apparel industry have been identified by industry officials and have also been delineated by the report issued by Barner, Berkstresser, Michel, and Williamson (1985). Shifts in the U.S. population are occurring as the baby boomers mature, as more elderly persons are living, and fewer children are being born. "The most significant shift...is the substantial growth in people in the 35-54 year age brackets" (AAMA, 1985, p. 7). The maturing baby boomers are in their peak earning years and are noted for their expenditures on both durable and non-durable consumer items. For apparel manufacturers indications are that these changes in the market place require reflective changes for apparel manufacturing, planning and marketing (Frank, 1988).

Business practices of apparel manufacturers. F. Fortess of the Philadelphia College of Textiles (personal communication, 1987) said that some apparel manufacturers have operated on the proposition that economies of scale are the most productive mode of operation. Economies of scale can reduce per unit fixed costs and with certain conditions will lead to improved profitability. This mode of operation can limit an apparel manufacturer's responsiveness to the consumer. Other traditional business practices which have

contributed to the decline of the industry include the harboring of trade secrets (Barnes, "Soon", 1987) and the short-term orientation of the apparel manufacturers (Drizen, 1986).

The Director of the Good Housekeeping Institute, G. Whamm (personal communication, 1987), stated that the apparel manufacturers have traditionally operated on the basis of solving today's problems first, and if time permits, long range planning can take place. Aston (1985) director of quality control for Formfit Rogers, stated that "a well-known statistician estimates that 80% of the problems (in the apparel industry) can be attributed to management error and the other 20% at the operator level" (p. 16).

Solutions Offered for Revitalization of the Apparel Industry

In their Delphi Study of 1978, KSA concluded that the apparel industry must develop strategies and management plans to overcome the problems of a changing market. They felt ways must be found to optimize sales, to increase productivity, and to increase profitability. Since the 1978 study, potential solutions for stabilizing and revitalizing the industry have been developed (Drizen, 1986).

> Awareness among apparel executives in every fact of the industry-retail, manufacturing, textile and contracting-is at full tilt. Ways and means for how contractors will survive in America over the next 10 years run rampant among industry executives. (p. 32)

The apparel industry and the potential solutions for the industry have been reviewed by management consulting firms, trade associations, academic departments, and the federal government. The solutions include: (a) government intervention, (b) the "Buy America" campaign, (c) automation of the industry, and (d) responsiveness to the consumer.

Government intervention. ATMI (1985) and AAMA (1987, May), trade associations for the textile and apparel industry, have taken positions in favor of the passage of the Textile and Apparel Trade Enforcement Act of 1985 and more recently are in support of the Textile and Apparel Trade Act of 1987. Their support for this legislation is "based on a Congressional finding that increased textile and apparel imports are causing serious injury to domestic producers" ("Facts on the Textile", 1987, April, p. 2).

The proposed legislation reestablishes levels of import quotas and has as its aim, the comprehensive coverage for all categories of textile and apparel goods and the restricted entry of some categories of goods. The suggested legislation also covers methods to increase controls for the enforcement of the quotas. Passage of the proposed act would expand the authority of the U.S. government for negotiation of future trade agreements.

Crafted with Pride campaign. The "Buy American" program is being sponsored by the Crafted with Pride Council and is designed to increase market demand for U.S. made

goods. Swift (1987) described the Council as a nonprofit organization which is sponsored by members of the entire fiber/textile/apparel complex and the related suppliers. Over 25 thousand companies give financial support to the Council. The "Buy American" campaign is designed to increase the retailers' and the consumers' awareness of domestic apparel. To create consumer demand for clothing which is made in the U.S., the Council has used the marketing methods of advertising and consumer awareness. Actual labeling of goods with the U.S. designation has been mandatory for apparel manufacturers since 1984 (Office of Technology Assessment, 1987).

The marketing plan outlined by the Crafted With Pride Council is a pull strategy. The Council plans to have the USA label gain an identity and a uniqueness to promote consumer recognition and purchase (Swift, 1987). The techniques for this plan have included extensive general coverage media, specifically TV; written media coverage aimed at the retailer; and hang tags and sew-in labels for use during the retail sale of garments. For the Crafted with Pride Council, the public relations plans for 1988 include the use of Miss America as spokesperson for the campaign and an extensive advertising promotion as sponsor of the Miss America Pageant ("Here they come", 1987, September).

Automation of the apparel industry. Potential for automation of the apparel industry is reviewed by Barner, Berkstresser, Michel, and Williamson (1985) in a report prepared at North Carolina State University on the technology in the textile and apparel industries. They found several areas of production, materials handling, and planning which could benefit from the use of the technologies of computers and automation.

> These trends (to new technology) arise because processes of the future in these industries will most desirably have minimum numbers of intermediate steps and minimum numbers of people involved in these steps. Another general aim is to design processes with less dependence of unit cost on volume, which therefore would allow management more choice of flexibility or mass throughput for any particular product at any particular time. (p. 278)

Barner, Berkstresser, Michel, and Williamson (1988), suggested that automation will lead to reductions in costs from the corresponding reductions in inventory and in the shorter production time. A faster turn over of goods from automation of production processes is designed to provide a higher return on the manufacturers investment in materials and equipment.

A study of the profitability of apparel manufacturing automation is being performed by the Textile/Clothing Technology Corporation [$(TC)^2$] (Office of Technology Assessment, 1987). The work of $(TC)^2$ is with domestic apparel manufacturers to design equipment and work flow to reduce the amount of human labor involved in apparel

production. Machines with the use of computers and robotics have been designed to fold, align, and join parts of a garment. Several sewing operations have been successfully automated for the production of men's suits.

Responsiveness to the consumer. The Daniel Management Center at the University of South Carolina (Effective Management, 1982) proposed a strategic positioning plan for solving the problems of the apparel manufacturers. The first step in strategic planning is for manufacturers to analyze their current position in the market. Secondly, they should analyze the demands of the consumer for future changes. They should operationalize their findings into action plans. The Crafted with Pride Council study as outlined by Drizen (1986) reiterated the second point of the Daniel Management Center's report. Manufacturers of apparel need to recognize the needs and demands of the customer and to react quickly to meet these customer's interests and wants.

The report from Barner, Berkstresser, Michel, and Williamson (1985) also encouraged the use of marketing methods. "In fact the time is ripe for marketers to more effectively exploit both broadly and narrowly defined segments within the market place with their products" (p. 408). AAMA in their 1984 report, Apparel Manufacturing Strategies, suggest that manufacturers should shift their

orientation from product and production centered philosophies to consumer and market centered policies.

Quick Response: A Strategy for Survival of the Apparel Industry

As the numbers of imports have grown and the market has changed, members from all segments of the fiber/textile/apparel complex have searched for ways to make the total industry more competitive and profitable (Swift, 1987). Since 1985, the multitude of solutions have been gathered under the umbrella label of Quick Response (AAMA, 1987b). The Quick Response concept is seen as a win/win strategy for textile manufacturers, apparel manufacturers, retailers, and all other related suppliers (Gillease, 1988b). The Textile Apparel Linkage Council (TALC) meeting in May 1985 in Dallas, Texas was the first joint industry meeting to promote the Quick Response ideas (T. Little, personal communication, 1987).

The general theory of Quick Response is described by several quotes from KSA (1986).

> We have to build retailer and supplier relationships, strengthen service, and apply the technology that will provide superior retail sell-through to the consumer and higher retail profitability. (p. 1)

> This is the Quick Response strategy. It focuses on integrating relationships between segments of the soft goods chain, better information flow, and more flexible technology to achieve Quick Response with less inventory throughout the system. (p. 1)

Getting Started in Quick Response was created by AAMA (1987b) as a working manual for apparel manufacturers and

other participants of the 1987 Bobbin Show. In this handbook, Frazier (1987) states that Quick Response is the process of getting "the right products, with the right information, at the right time and place" (p. 1).

The policies outlined by AAMA at the Bobbin show are very similar to the marketing strategies provided in the report by Barner, Berkstresser, Michel, and Williamson (1985). Knowing your customer and planning your production to meet the customer's needs are also basic marketing concepts explained by Levitt (1960) and Kotler (1984). From reviewing these references, the parallel is drawn between Quick Response for the textile/apparel/retail industry and general marketing technique for any business.

Theories for Quick Response's effectiveness. The first pilot studies in the benefits of the Quick Response linkage which were sponsored by E. I Du Pont de Nemours & Company and the Crafted with Pride Council. The strategies used to implement the Quick Response programs incorporated several basic production, marketing, and management tenets. The financial and market share benefits recognized by the companies which participated in the pilot studies are significant. Although implementation of the Quick Response linkages and small lot processing involved additional primary costs, the returns to the company in increased sell-through at full price and in improved reorders offset these start-up costs. Cotton (1986), a senior financial advisor

for the Du Pont Company, has stated that "not only can (apparel manufacturers) prosper doing today's business using Quick Response techniques but also can win back business from the Far East" (p. 26).

Although no one source is considered conclusive in its delineation of Quick Response, three basic concepts emerge from a review of industry literature, interviews, and production information: (a) the communication of information between trading partners, (b) the reduction of time in the soft goods pipeline, and (c) the responsiveness to the consumers' demands. As the first facet of Quick Response, communication and partnership between trading entities is considered by many textile and apparel industry leaders to be the key to the success of this new strategy. To achieve the benefits from the tools of planned production, shorter lead times, reduced inventories, and computerized distribution, all trading partners will have to have better communication and delivery schedules than previously found in the industry (McLean, 1986; Mitchell, 1987). Partnerships must be built based on trust, information, and examination of production processes.

The second facet to Quick Response is the reduction of time in the soft goods pipeline. Length of time which goods remain in the pipeline is a function of their time in inventory and distribution as well as their time in production. Weintraub (1987c), a member of the Weintraub

management consulting firm, states that dependance on import sourcing has encouraged longer lead times instead of shorter times. To be reactive to consumers and to be competitive with imports, the traditional, domestic 66 week replenishment cycle will have to be shortened to a few weeks or even a few days (McLean, 1986). A survey (Davidson, 1988) of apparel production by Werner International found the average delivery time from fiber selection to final retail sale was 56 weeks. The goods were in actual production or transportation only 5.8% of the time or 23 days out of 395.

For the majority of the 56 weeks, the goods were waiting for further production, transportation, or put-up. This waiting time adds cost to the goods because of investment in materials and downtime of equipment. Shortening the soft goods pipeline requires improved communication between partners and smoother work flow. The theories behind this set of procedures are based upon the economies developed with standardization of procedures (International Standards Organization, 1982). Standardization of procedures, formalization of information transfer, and development of partnerships between suppliers and customers should result in reduction in costs (Thome, 1986).

The third factor in Quick Response strategies is the textile/apparel industry's responsiveness to the consumers'

demands. With rapidly changing markets and shifting population sizes, the apparel industry, in order to maintain an effective marketing position, should be more aware of the demands of the consumer (Sampson, 1985). The theory behind effective marketing requires examination of the source of the movement of goods through the pipeline. Goods should be propelled by a pull from the consumer instead of a push from the textile or apparel manufacturer. The Leslie Fay Manufacturing Company in a Quick Response Pilot Study found that their market share increased with the improved knowledge of their ultimate consumer. Information was gained by their partnership with Dillard Department Stores (Haber, 1988). As shown in this pilot study, the success of the third facet, awareness of consumer demands, is dependant on the successful implementation of the rest of Quick Response.

Tools for the implementation of Quick Response. The methods for implementation of Quick Response have been studied by Little (1987), Kurt Salmon Associates (KSA) ("Retailers Move", 1987), and Kosh (1988). Little (1987), representative of North Carolina State University to the Textile Apparel Linkage Council (TALC), surveyed TALC members to document their usage of Quick Response techniques. KSA in conjunction with the Du Pont Company ("Retailers Move", 1987) surveyed 100 businesses in the textile/apparel/retail complex. Kosh (1988), a private

consulting firm, had 37 apparel manufacturing companies respond to their survey about usage of computers in apparel manufacturing. A variety of manufacturing areas involved in Quick Response and a number of tools used by the apparel manufacturer to implement Quick Response are identified by these studies. These studies do not use the same terminology nor provide any general categories for grouping the multitude of techniques used by textile and apparel manufacturers who have implemented Quick Response in their operations and procedures. The following review of the tools and production processes of Quick Response is grouped according to the three broad theories which were previously drawn from the review of the industry.

The communication of information between trading partners can be enhanced by a number of methods. An efficient method of communication is electronic data interchange (EDI). This tool was used by the participants in the Crafted with Pride Pilot Studies (Technical Advisory Committee of AAMA, 1987). R. Auman (personal communication, 1987), in Computer Services for Cone Mills, explains that bar coding of textile rolls and apparel products is being used to enhance the movement of the goods in the pipeline. The standards for bar coding and other communication devices used by apparel manufacturers and their trading partners have been developed by the Textile Apparel Linkage Council (TALC) (1987), the Sundries and Apparel Findings Linkage

Council (SAFLINC) (1987) and the Voluntary Interindustry Communications Standards Committee (VICS) ("Retailing industry", 1987). Standards for EDI enhance linkages between apparel manufacturers and retailers. This linkage provides communication of information gathered from electronic cash registers at the point of sale (POS). Standards allow for the elimination of redundant testing and for an increase in profitability. Standards promote the purposes of Quick Response.

Reduction of the time in the soft goods pipeline can be achieved by reducing the time the goods are in transition from the supplier, in waiting in inventory, in production within the manufacturing facility, and in distribution to the customer. To deliver apparel to the retailer at the peak of consumer demand, the apparel manufacturer must utilize new operational tools in his business. Automation is a viable tool in the area of design, pattern marking, and pattern grading. In these departments, computers can be used to reduce the amount of repetitious work done by operators, plus increase the speed of operation (Beaulieu, 1987, September).

Improvement of productivity, as described by Sampson (1985) in his speech to TNT-ASQC, can be achieved through use of the new advanced mechanical and electronic equipment. Sewing automation tools include methods for fabric handling, alignment of seam edges, and folding and turning garment

pieces ("The Story of $(TC)^2$", 1987). Brewington (1985), director for apparel planning and cost reduction service at Milliken, reports that automation of production processes is a method for reducing time in the pipeline and for reducing the labor costs in the production of the garment. The Kosh (1987) study identified and examined 19 apparel manufacturing functions which could be automated with the use of computers. The moderate sized companies were found to have the most computer automation. Increase in size accompanied increase return for computerization of operations. When a company had over 200 employees, the cost of automation was offset by the reduction in labor costs. The results for these companies were shorter lead times, faster turn around, and the potential for a 400% increase in productivity.

Another tool for shortening the pipeline is short cycle production. Traditionally, the cut and sew plant has used bundles of fabric and single skill operators which require long throughput times. Short cycle production involves the simplification of the cutting and sewing rooms. This strategy is reviewed by a special Bobbin report (Shepherd, 1987). By sending one complete garment through the plant as a unit, short cycle production systems combine the features of both flexibility and time savings for apparel manufacturers. Financial savings are also realized, because short cycle production reduces the amount of wait time and

the level of inventory. Unit production systems are suggested as the proper tool for handling fabric in short cycle production (Tray, 1987).

To complete the Quick Response automation process, the apparel manufacturer must improve his distribution center (Weller, 1987). Apparel can not be sold at a profit if it is allowed to reside too long in the warehouse of either the manufacturer or the retailer. Wait time must be reduced, and storage and retrieval of goods must be quick and efficient. To obtain the maximum sale price, the merchandise must reach the consumer at the right point in the fashion cycle.

To be responsive to the consumer the apparel manufacturer must have information about the consumer. With the Quick Response strategy, he should obtain and use point of sale (POS) information to plan product lines and production schedules to meet the identified demands. Electronic linkage with customers is possible with computerized cash registers, bar coding of goods, and automatic order/reorder systems. "A constant array of new fresh merchandise offered on a timely basis is the answer" (Weintraub, 1987b, p. 20). The use of computers for designing and planning can assist the apparel manufacturer in making changes, testing garments, and communicating with the retailer. J. Knabe, president and CEO of Associated Merchandise Corporation told the Knitted Textile Association

that, "'Technology, not price is the competitive edge' American manufacturers must maintain to become successful" (Pollock, 1987, p. 12).

Moderating factors influencing the implementation of Quick Response. Even though the Quick Response success stories have been published and the competition in the marketing environment has continued to increase, not all apparel manufacturers have embraced the strategy of Quick Response. A survey by the Textile Consulting Division of Ernst and Whinney ("Are you doing," 1988) ask textile and apparel managers and other corporate executives about their knowledge and opinions of Quick Response. "The survey shows mills have a high Quick Response interest and awareness level, but implementation has a way to go" (p. 49).

Those companies with the first published successes with Quick Response are the pilot studies initiated by the Crafted with Pride Council (Swift, 1987). An examination of these companies indicate several similar factors in their demographic characteristics. First, the success stories are about large manufacturers, for example, Milliken, Haggar, and Arrow. The Technical Advisory Committee of AAMA (1987) reports that the linkage among JC Penney, Lanier, and Burlington Industries resulted in a 59% increase in unit sales and an 82% increase in gross margin dollars.

The size of the company has become an issue when making decisions about Quick Response. The initial investment in

Quick Response can require a large amount of capital; however, Milliken (1987) "disagrees with the claim that Quick Response is expensive to implement" (p. 32). He says that the returns on the investment justify the size of the capital expenditures. The size controversy continues as J. William, president of the National Retail Merchants Association (NRNA), reports in a recent interview with Women's Wear Daily (WWD) (Haber, 1988, April). William says that Quick Response techniques are used more by the large retailer and manufacturer. He finds that small companies do not have the capital to develop an electronic network. The returns may be proven, but the initial outlay of capital may still be beyond the reach of the many thousands of small U.S. apparel manufacturers. Another side of the size controversy is that small companies, both apparel and retail, have fewer levels of management and, therefore, are freer to make rapid and radical changes in methods of operation. The returns are also more obvious to these small manufacturers (Honigsbaum, 1988, April 14).

The success stories have been dominated by the men's wear manufacturers: Haggar which manufactures slacks, Lanier which manufactures tailored clothing, and Seminole which also manufactures slacks (Technical Advisory Committee of AAMA, 1987). Traditionally, men's wear is slow to change in styling, and the plants which manufacturer men's wear are more automated in production than women's wear. Women's

wear tends to incorporate more fashion items and seasonal goods. The increase in the number of selling seasons for women's wear requires manufacturers to use more labor, to produce more lines, and to have smaller production lots.

Many sources feel that the retail segment of the soft goods chain is now driving the changes in the apparel industry (Braden, Holford, & Richardson, 1987). If the retailer is the channel captain, one can deduce that the type of retail customer serviced by the apparel manufacturer might influence a manufacturer's implementation of Quick Response. Retail customers can be categorized by their type of marketing and distribution methods: department stores; limited-line, specialty stores; mass merchandisers and discount stores; and a small section of other chains and individual operations (Kotler, 1984). Retailers can also be grouped by size and type of ownership. Gillease (1988b), director of the Textile Division of Du Pont Textile Fibers, reviewed the KSA study of 100 textile/apparel business units. From the study, he concludes that Quick Response linkages are initiated and demanded by the retail segment of the pipeline.

Type of goods or product families may be another moderating factor in the selection and implementation of Quick Response strategies. Weintraub (1987a) states that "(fashion) apparel is time-sensitive, with a short shelf, or selling life" (p. 22). The handling of such a product might

affect a manufacturer's choice of Quick Response strategies. In their report to Knitted Apparel Manufacturers, KSA (1987) recommends different marketing strategies for different product classifications. Greenspan, executive director for the Federation of Apparel Manufacturers, Inc., was interviewed by WWD about his opinions of Quick Response (Haber, 1988). He said that Quick Response was not quick enough to satisfy the speed of the turnover for fashion goods. Manufacturers dealing in fashion goods handle about 500% more stock keeping units (SKUs) than manufacturers of basic goods, and the number of seasons manufactured per year increases 300% from the number of seasons for basic goods (Kimberlin, 1988).

The adoption and application of Quick Response in the pilot studies was in part successful because of a number of organizational and managerial factors. The production operation in an apparel manufacturing company exists within a business structure. Production is but one of a number of different functions. Barner, Berkstresser, Michel, and Williamson (1985) in their report on the textile and apparel industry conclude that:

> for the American textile and apparel industries to enjoy the benefits of robotic systems applications, management must recognize that entirely new approaches to human factors and financial management will be required. (p. 303)

If changes in production require changes in management, the assumption follows that the changes required by the

implementation of Quick Response might also require changes in management and management's attitudes. Gillease (1988a) concludes in his review of the KSA study that:

> Many of the basic operating principles of Quick Response challenges the goals and values the soft goods industry has used for years. If Quick Response is to work effectively-as it must to make a lasting difference-the traditional operating cultures will have to change. (p. 48)

The attitude and involvement of top management is of vital importance to the success of any new business endeavour. M. Crow, president of J.P. Stevens & Co., spoke at the Textile World Quick Response Conference and Exhibition. He stated a concern for the entire industry complex: "'The only limitations to establishing Quick Response programs are textile executives' attitudes toward Quick Response concepts'" ("Quick Response:", 1987, p. 26). The survey by KSA ("Retailers move", 1987) shows that many industry officials are talking about Quick Response, but the conversion of the industry to a responsive manufacturing segment of the economy is far from being accomplished. Of the 33 apparel manufacturers reviewed, the Quick Response area of highest involvement was direct, frequent shipments with 60% involvement. Use of bar codes, EDI, and automatic reorders had a low participation rate of 30%. The executives at KSA conclude that "the most difficult aspect of the Quick Response concept is to prove that it actually works in practice" (Davidson (1988).

Many of the Quick Response techniques which have been reviewed require changes in traditional operating practices. The American Textile International magazine surveyed both apparel and textile manufacturing executives for their attitudes on Quick Response. Results of the survey showed:

> that many (executives) still find it difficult to believe that it is possible to replace the suspicious and adversarial market relationships, normal in the textile and apparel business, with trust and cooperation. (Davidson, 1988, p. 54)

Impact of Quick Response on apparel products. As imports increase, the markets change, and corporate thinking shifts in the apparel industry's environment, corresponding changes have occurred in the production operations within the industry. Some industry officials think that these new production, distribution, and communication processes may have an impact on the products which have evolved from this system of apparel manufacturing. R. Vetack, senior vice president at Cone Mills ("Retailers Move", 1987) has stated that the entire industry complex is now experiencing a "'unique dilemma'" (p. 58) as changes in production and distribution are changing the face of the industry. Some industry officials predict that the apparel industry will become polarized into two distinct groups ("Life in the Fast Lane", 1987):

> Those that produce goods with few fashion changes each year are perhaps the most automated, while fashion-driven companies such as Prophecy are looking for more flexibility in machinery than what's available. (p. 92)

A few apparel manufacturers have linked with the other partners in their channel to the point that they have achieved vertical integration. This vertical structure is seen in the corporate structure achieved by The Limited ("How the Limited's", 1987). The prediction by J. Bakane (personal communication, 1987), Vice President of Cone Mills, is that these apparel companies will have fewer SKUs, high degrees of linkage, fewer sources, and a corresponding reduction in versatility.

Apparel manufacturers working in the Quick Response type of pipeline will expect long term commitments from their customers and must be willing to make similar commitments with their suppliers (Palmieri, 1987). A true partnership with information sharing, on time shipments, and quality goods as ordered is necessary for a Quick Response program to be cost and market effective. An apparel manufacturer with major commitments to both supplier and customer is apt to slip into the old habits of economies of scale and a production orientation (Sampson, 1985). Can these manufacturers who so closely adopt portions of Quick Response change with the minute fluctuations in the markets and be market sensitive?

In contrast to the high volume apparel manufacturers, the fashion apparel business as described by H. May (personal communication, 1987), president of Peaches and Cream, must have quick and responsive, product styling. To

respond to the changing demands of a fashion conscious consumer, the manufacturer may need small lot manufacturing (Maycumber, 1987, September 21) and frequent interaction with the buyers and designers of their retail customers. Will this be accompanied by a necessary rise in costs of their goods or will the market place experience the loss of variety in colors, patterns, fabrics, and styling which the consumer has come to expect?

The success stories of Quick Response are being written every day, and still many apparel manufacturers do not change their operating procedures. Even in the face of high unemployment, increased competition from textile/apparel imports, and frequent plant closings and buyouts, some apparel manufacturers do not adopt the tools of Quick Response. The linkage among participants in the soft goods pipeline can not be formed without the cooperation and partnership developed through Quick Response techniques. This review of trade literature, recent industry studies, and personal interviews has indicated a number of variables which may correlate with the decision of a company to use Quick Response. Size of the manufacturing facility, target customer for the goods, retail customers, shelf life of the product, and management attitudes are indicated as potential moderators for the Quick Response decision and the impact of such a decision on the marketing environment of an apparel manufacturer.

CHAPTER III

METHODOLOGY

The purpose of this study was to obtain demographic information about apparel manufacturers and to collect information about their Quick Response operational procedures. For this study, the sample, consisting of apparel manufacturers, was selected at random from the population of North Carolina apparel manufacturers. This chapter reviews the structure of both the target and accessible populations. Presented in this chapter are (1) sample description and selection, (2) research design including the type and validity of the design, (3) the structure and development of the instrument, (4) data collection procedures, and (5) data analysis procedures.

Sample

Description. The target population of this study is the U.S. apparel manufacturers. The products from these manufacturers include basic goods, seasonal goods, and fashion goods. These apparel manufacturers may range in size from cottage industries with a few employees to larger manufacturers with 100 or more employees. Less than 20% of all U.S. apparel manufacturers employ over 100 employees per business unit (U.S. Bureau of Census, 1984a, 1986). The types of products manufactured are diverse and range from

industrial protective apparel to unique one of a kind couture. Target consumers include men, women, and children in ages from infant to elderly.

Size and selection. The accessible population for this study was limited to apparel manufacturers located within North Carolina. Although this is a purposive selection from the general target population, the importance of North Carolina to the total textile/apparel industry is significant. Textile and apparel manufacturing operations in North Carolina make measurable contributions to the nation's economy. Over 25% of all domestic textile mill products and about 10% of apparel products manufactured in this country are produced in North Carolina (North Carolina Department of Commerce, 1987b). Sixty-five percent of the U.S. production of women's hosiery, except socks, is made in North Carolina. In the category of men's and boys' shirts and nightwear, over 14% of the nation's production is produced in North Carolina (North Carolina Department of Commerce, 1987b). North Carolina ranks seventh among the states in persons employed in apparel manufacturing and in numbers of apparel manufacturing units located within the state (Massey, 1986 and U.S. Bureau of Census, 1987c). Textile mill production and apparel production are the largest manufacturing employers in North Carolina (North Carolina Department of Commerce, 1987b).

The recent focus of Quick Response studies and articles in trade journals has been on the major apparel manufacturers and corresponding major retailers. Nationwide nearly three-fourths of the apparel manufacturing firms are small with fewer than 50 employees (U.S. Bureau of Census, 1984a and 1984b) (see Table 3). Inclusion of the small apparel manufacturer is an important point in this study since most studies of Quick Response have involved the large manufacturer. The North Carolina apparel manufacturing industry represents the full scale of size of manufacturing operations with plants employing over 2,500 workers to those

Table 3

Employees Per Establishment For U.S. and NC Apparel Manufacturers

	U.S.(1984)	% OF TOTAL	NC(1987)	% OF TOTAL
1-19	12,579	55	17	2
20-49	4,549	20	67	9
50-99	2,784	12	103	14
100-249	2,109	9	191	26
250-499	738	3	98	13
500+	219	1	37	5
TOTAL	22,948	100	734	100

small plants employing less than 5 workers (North Carolina Department of Commerce, 1987a). Although all sizes of operations are located in the state, more medium and large operations are located in North Carolina than represented by the percentages for the national averages. For this study, a disproportionate sampling method was used to insure equal representation of categories for the comparisons.

Stratified sampling, as described in Steel and Torrie, Principles and Procedures of Statistics (1980), was used for sample selection for the mailed questionnaire. Stratified sampling was used because systematic differences were expected to occur from stratum to stratum. Since the investigation of differences among the strata were important, the sampling for the study included equal numbers from each stratum. Each cell was designed to have 15 units. A few cells in the extremes of size, both large and small, have less units because of the lack of population in these categories. Eighteen cells were formed by the intersections of two strata and the levels within each strata. Sample size as shown in Table 4 was 203, approximately 15 units per cell. A random draw system was used for selecting the samples for each cell.

The list used for drawing the sample was The 1987-1988 Directory of Manufacturing Firms in North Carolina (North Carolina Department of Commerce, 1987a). The directory was prepared by the Office of Economic Development of the North

Carolina Department of Commerce. The Department of Commerce considers this lit to be an inclusive listing of all apparel and other finished textile products manufacturers in North Carolina who are covered by the SIC code 23. The sample for the study was drawn from only those SIC codes which cover apparel. The North Carolina list is further stratified by the variables of size and target consumer which are variables in this study's hypotheses.

As shown in Table 4, size is divided into six categories according to number of employees. Target

Table 4

Number of Plants per Cell Sorted by Target Consumer and Size by Number of Employees

	Target Consumer				
Size	Men	Women	Children	Total	%
1-19	2	9	3	14	7
20-49	15	15	7	37	18
50-99	15	15	15	45	22
100-249	15	15	15	45	22
250-499	15	15	6	36	18
500+	12	11	3	26	13
Total	74	80	49	203	100
%	36	39	24	100	

consumer categories are: men and boys, women and girls, and children and infants. End use categories were not used for two reasons. First, the categories listed in the North Carolina directory do not correspond to the U.S. Government SIC codes; therefore, comparison data for different categories would be inaccurate. Second, the North Carolina list is not fully descriptive, and individual strata developed from the list would not be mutually exclusive. A question about SIC codes was included in the questionnaire for clarification between the two government sources.

The list does not stratify the apparel manufacturers by the additional variables of seasonality of goods, retail customer and corporate structure. For this reason, sorting of apparel manufacturers by these variable was performed after the collection of the data from the mailed questionnaire. One of the added benefits of this study is the collection of demographic information which is not available about the apparel manufacturers in this state. Lack of ability to randomly sample according to the variables of goods' seasonality and retail customer reduced the representative nature of the sample. The lack of random sampling for some variables may reduce the generalization of some of the results.

Research Design

Type of Design. The research design of this study was divided into two parts, one part descriptive and one part ex

post facto. Quick Response as a strategy for the apparel industry is a new concept with limited formal study. The apparel industry has a large, fluctuating, and diverse population. Many companies are privately owned, and the keeping of trade secrets has been a tradition in the industry. For these and other reasons, little information has been collected about its demographic characteristics. To gather needed industry demographics, the first portion of this study was descriptive. The purpose of this survey research was to collect information about the general status of the apparel industry and about the specific application of the Quick Response strategy to the textile/apparel partnership. The collection of this information was completed with the use of personal interviews with industry officials and from the demographics portion of the mailed questionnaire. The information from the interviews was particularly useful in developing the Quick Response categories for the mailed questionnaire.

The second division for this study was an ex post facto investigation of the current status and implications of Quick Response among apparel manufacturers. The ex post facto research design allowed the researcher to examine what effect being in a particular group had on another variable. In this instance, the effect of being a certain size, having a different retail customer, manufacturing garments for different consumer groups, and manufacturing seasonal,

basic, or fashion apparel was examined for the relationship to the identified level of Quick Response techniques used by the manufacturer. The potential correlation between Quick Response strategies and product line changes was also studied with the ex post facto research design.

The situation of diverse apparel manufacturer characteristics and implementation of Quick Response was a preexisting condition so no manipulation of variables could be used. A cause and effect relationship can not be readily determined, but with the clear time sequencing of events and the control from the introduction of relevant variables support can be made for a causal inference (Ary, Jacobs, & Razavieh, 1985). By satisfying these research design conditions, the information from this study can be used to make predictions and to view relationships within the industry.

Making predictions about the implementation of Quick Response is important for a textile manufacturer who is determining the marketing effectiveness of his strategies. As with any new strategy the industry should determine corresponding changes and associated impact on the retailer or consumer. Consumers should be aware of the potential for change in their market choices.

Design validity. Although valuable information about relationships between variables can be obtained from an ex post facto study, the predisposition of the treatment

reduces the amount of control the researcher has over internal validity. This prior grouping of the sample has a resulting loss of control over the extraneous variables. The researcher recognized the potential for spurious results, as described by Ary, Jacobs, and Razavieh (1985), and tried to control for such intervention by the homogeneity achieved from stratified random samples.

Reverse causality was not viewed as a problem, because of the recent nature of the Quick Response techniques. The potential for common cause variables was recognized. Environmental circumstances or other common cause variables could have affected the manufacturers without regard to the variables in the study. Some of the potential common cause variables were incorporated into the study. The literature search and the interviews with industry officials were used to determine the existence of multiple variables to be included in the survey. Analysis of variance was used to systematically identify the statistical significance of the industry relevant variables.

To assure the external validity of the results, the sample was drawn by random selection from the accessible population. To validate the generalizability of the results from the sample to the accessible population, the characteristics of the respondents were analyzed to confirm a match with the accessible population.

Instrumentation

A mailed questionnaire was sent to 203 North Carolina apparel manufacturers. The questionnaire was designed to investigate the relationship of the demographic variables of size, target consumer, seasonality of product, and retail customer to the Quick Response activity of an apparel manufacturer. Further analysis included correlations between the Quick Response activity and the recent changes for the manufacturing operations. No instrument was available for specifically measuring the Quick Response activity of apparel manufacturers; therefore, the items for the questionnaire were accumulated from the review of literature and were refined by testing with North Carolina textile and apparel manufacturers. With the selective nature of the population, extensive pretesting of the questionnaire was not possible because of the danger of confounding the results.

Structure. The items in the mailed questionnaire were selected from variables indicated to be pertinent by the literature and from interviews with industry personnel. Topics covered by the questionnaire include: (a) Quick Response operational procedures-planning techniques, production procedures, and distribution methods; (b) recent industry changes--pricing, impact on the products, and customer services; and (c) moderating factors--company size, target markets, uniqueness of product, and attitudes of

management. The organization and terminology of the questionnaire were selected to be consistent with apparel industry information. Questionnaire design was reviewed with industry personnel.

The questionnaire was designed for data collection about North Carolina apparel manufacturers. The data were used to test the hypotheses about Quick Response and apparel manufacturers. Hypothesis 1 had four parts, each one testing the influence of a demographic characteristic on an apparel manufacturer's Quick Response activities. Hypothesis 2 examined the correlation between Quick Response activities and industry changes. The independent and dependent variables for each hypothesis are in Table 5.

Table 5

Independent and Dependent Variables for the Hypotheses

Hypothesis	Independent Variable	Dependent Variable
1a	Target Consumer	Quick Response
1b	Size of Operation	Quick Response
1c	Seasonality of Product	Quick Response
1d	Retail Customer	Quick Response
2	Quick Response	Amount of Change

The complete questionnaire is located in Appendix A. The content of each variable is discussed under the specific areas:

1. Quick Response Activities. The Quick Response activities variable is constructed from a listing of operational procedures. A number of procedures are included: short cycle manufacturing, use of POS information, EDI confirmations, garment dyeing, information sharing, reduction in inventory, and small lot orders. Several of the items in this section were collected from the Quick Response industry studies by Little (1987) and KSA ("Retailers Move", 1987). Additional items were identified through industry literature and interviews. The percentages for this section are used in accordance with recommendations by industry personnel and are designed to aid the respondent for quick and nonarithmetic responses. The words Quick Response were not used in this section to remove opinion and bias from the technical questions.

2. Amount of Change. The textile/apparel/retail industry has undergone a number of changes during the past five years. Changes in the product and the customer services for the apparel manufacturer include: number of stock keeping units (SKUs), product line length, brand recognition, pricing, customer contacts, target markets, shipments, and styling. The items in this section were drawn from the review of industry information and include

changes which are thought to be caused by the impact of Quick Response. For ease of reading and responding, the change items were grouped into two sections: (a) process and product changes and (b) changes between supplier and customer. The respondents were asked to rank the amount of change from a -2 for maximum decrease in the item to a maximum increase of a +2.

3. Target consumer. The variable, target consumer, is traditionally divided into three groups: men, women, and children. The Kosh study (1988) expanded the list to seven groups: men; women; children; men and children; women and children; men and women; and men, women, and children. All seven categories were included in the questionnaire to investigate the growth and differentiation of groups.

For comparison to traditional divisions of the target consumer and for purposes of analysis, the seven categories of target consumers in the questionnaire were collapsed to four categories. The four categories were formed by combining each of three pairs of similar, original categories. The category of men and children was combined with the category for men, and a similar combination was made for the two women's categories. The two categories of men and women and of men, women, and children were also combined to form a single category. The resulting four groups were men, women, children, and multiple types.

4. Size of manufacturing operations. The size of the manufacturing operation can be measured in number of employees or dollar amounts for annual sales. The number of employees for manufacturing establishments is available from government sources, and the categories are consistent between state and federal sources. The dollar volume for annual sales is proprietary information and is readily available only for public companies. Since the majority of apparel manufacturers are privately held companies, limited information is available about the sales volume for apparel manufacturers. Both measures of size were included in the questionnaire, were correlated for their degree of similarity, and were used as independent measures of the variable for testing the hypothesis.

5. Seasonality of goods. These classifications are segmented by the length of a season in terms of weeks. The first three categories of seasonality of goods follow the standard government classifications: basic goods, seasonal goods, and fashion goods. In addition, a fourth category of highly seasonal or continuous fashion was included in this variable, because the industry interviews and literature indicated a growth in this subgroup.

6. Retail customers. Industry literature indicates that the retail customer is the force behind the adoption of Quick Response throughout the entire textile/apparel/retail complex. Retail customers can be identified and segmented

in several different categories (Kotler, 1984). Three different aspects of the retail customer were investigated: the type of retail operation, the size/ownership of the business, and the relationship between the retailer and the apparel manufacturer. Each of these categories with levels was represented by a separate question in the questionnaire and was used independently for testing the corresponding hypothesis.

Reliability and validity. Content validity for the mailed questionnaire was tested by comparison to a table of specifications formed from the review of literature. The KSA study ("Retailers move", 1987) and the TALC study (Little, 1987) provided content guidelines for item selection when designing the questionnaire.

Content validity was further tested by reviewing the questions with industry personnel for a judgement by experts. While developing the questionnaire, face-to-face interviews were held with a variety of members of the textile and apparel industry. The items in the questionnaire and the format of the questionnaire were reviewed with both suppliers and customers in the North Carolina textile/apparel linkage. Information from these interviews was used to revise the questionnaire and to develop new items for the questionnaire.

To test the reliability of the Quick Response list in Section I, direct questions about Quick Response and Just-

in-Time (JIT) usage were added to the list of demographic multiple choice questions. For each individual, the responses to the two different sets of equivalent items were tested for similarity. "A test (questionnaire) is reliable to the extent that the scores made by an individual remain nearly the same in repeated measurements" (Ary, Jacobs, & Razavieh, 1985, p. 229). The questions asked for a yes or no response to the use of Quick Response or JIT and should have a positive correlation with the level of Quick Response activity.

The responses to the two questions were compared to the Quick Response scores obtained from Section I. Since measures of reliability depend on the standard error of measurement, a statistically significant variance from the difference between the mean Quick Response scores of yes responses and no responses was considered to be an indication of reliability. High usage of the Quick Response techniques was expected to correspond to a yes to Quick Response usage. If the differences were statistically significant, the results would support the theory that JIT is a subdivision of Quick Response. Consequently, the scores from the Quick Response section would not be expected to correlate with high Quick Response usage with only yes JIT responses.

To improve the accuracy of response and to encourage completion of the questions, the format of the mailed

questionnaire was designed to be brief and easy to answer. Since the study was interested in small apparel manufacturers as well as the major corporations, the brevity of the instrument was important. Small apparel manufacturing operations are often owner operated and have limited managerial staff. The instrument, because of its brief length, omitted questions about some techniques, specialized products, or subcategories of manufacturing which may exist in the variable fashion industry.

The physical format of the instrument was also formulated to encourage response. A high response rate was desired to increase the validity of the results. The questionnaire was printed on 17 x 11 inch paper and was folded to conform to the size of 8 1/2 x 11 inch paper. The overall effect was to duplicate standard business documents. The questions were subdivided into three main sections with further subsections. The small units of material were thought to increase speed of response. The average time to answer the questionnaire was 10 minutes.

Data Collection

A mailed questionnaire was used for collecting the data from the selected North Carolina apparel manufacturers. The questionnaire was mailed with an explanatory cover letter to all manufacturers in the sample. A follow-up letter and second copy of the questionnaire were sent to

nonrespondents. A final follow-up with phone calls was used to investigate the remaining nonrespondents.

Methods. The data for the tests of the hypotheses about Quick Response and the industry demographics were collected with a mailed questionnaire. The mailed questionnaire allowed for the coverage of a larger number of sample units and a selected geographic area, the state of North Carolina. The mailed questionnaire provided confidentiality to the respondents. Through the face-to-face interviews used for developing the questionnaire, confidentiality was found to be of maximum concern for many textile and apparel manufacturers. The study was performed as a double blind study, and the questionnaires were mailed with the endorsement of the College of Textiles at North Carolina State University. The questionnaires were returned to a third party, the Department of Management and Technology at North Carolina State University.

To protect the privacy of the apparel manufacturers, the questionnaires contained no identifying marks. To monitor the return list, a courtesy post card was included in the mailing package. The post card could be returned separately from the questionnaire. The post card was printed with the company's name and address and could be used by the apparel company to request removal from the follow-up lists. The card could also be used to request an

executive summary of the results which was used as an inducement to return the questionnaire.

The use of cards for tracking returns and the lack of identification on the questionnaires reduced the accuracy of the follow-up, but this anonymity was deemed necessary for the situation. The double blind feature was important when studying Quick Response, because of the volatile nature of this new and sometimes controversial subject. Reduction of researcher intervention and maintenance of confidentiality were further enhanced by the double blind technique. The screening from the researcher was also useful because of the traditional attitudes in the industry of the secrecy of trade techniques.

Time schedule and mailing package. The data collection steps for mailing followed the outline set by Amidon (1988) for the survey of the textile printing industry. The total mailing included a prenotification letter, the first questionnaire mailing, a thank-you/reminder post card, and a follow-up mailing of the questionnaire (see Appendix B). The source list for the sample did not include the names of the plant managers or any other plant official. The lack of names restricted the personalization of the mailings; however, first class postage and individual typing was used for envelopes and letters.

Time scheduling for data collection with the mailed questionnaire was as follows:

1. Week 1--Send pre notification letter

2. Week 2--Send out cover letter; questionnaire; self-addressed, stamped, return envelope; and stamped, self-addressed, courtesy post card

3. Week 4--Send out thank-you/reminder post card

4. Week 6--For nonrespondents, a follow-up letter, questionnaire, return envelope, and courtesy card

5. Week 8--For final group of nonrespondents, sample by telephone

After the thank-you reminder post card was sent, phone calls were received from eight different apparel manufacturers. These respondents indicated that they had not received the first mailed questionnaire. An additional questionnaire was immediately mailed to the person who was identified in the phone call. These remail contacts were also included in the second general mailing of the questionnaire on Week 6.

An attempt was made to contact all nonrespondents by phone during Week 8. During this time, the apparel manufacturing units with undeliverable addresses were checked with telephone operators to verify the possible existence of the company. A total of 21 questionnaires were remailed to units in the sample who indicated by phone that they did not receive any of the previous mailings. Each of these questionnaires were addressed to the individual identified by the follow-up phone calls.

Data Analysis

Demographic information was interpreted with the descriptive statistics of percentages and frequency distributions. Raw data from the Quick Response section were analyzed for reliability of the test measure and for homogeneity of the list. Using analysis of variance, the data were studied to determine which of the industry relevant variables were statistically significant elements in an apparel manufacturer's implementation of Quick Response (Hypotheses 1a, b, c, and d). To explore the contrast statements for levels within each variable, descriptive statistics were used including mean scores, range, and variance. Analysis of data was performed to identify changes in the augmented product which correlated with the production and distribution changes associated with Quick Response (Hypothesis 2).

A data base with 52 different variables was developed for the responses from the questionnaires. Each item on the questionnaire was assigned a code and was maintained in the data base as an individual variable. In addition, several summation variables were formed. A Quick Response Quotient was created from the sum of each subject's responses to Section I of the questionnaire. A Change Factor, a summation variable, was derived from the items in Section II.

The Quick Response summation variable was tested for homogeneity with a SAS computer program for Principle Components Method of Factor Analysis with Varimax Rotation (SAS Institute, Inc, 1985). This computer program treats all variables in the test as equally important. Factor analysis (PROC FACTOR) was used to test the Quick Response summation variable for one common underlying factor. The 17 variables forming the Quick Response Quotient were tested. If one total summation factor was appropriate, all the Quick Response activities from Section I of the questionnaire would load on one factor.

If multiple factors resulted from the factor procedure, the reliability of such factors were tested with the reliability program from SPSS-X (SPSS Inc, 1988). Factor analysis only shows the existence of factors and the presence of an underlying construct. The reliability of the group of items as representative of that construct must also be tested. The reliability of each factor is tested to provide an estimation of how consistently and accurately the included items measure the underlying construct (Ary, Jacobs, & Razavieh, 1985).

For additional validation of the Quick Response measure, the Quick Response items were tested for variance with the direct question about Quick Response usage and the one about Just-in-Time (JIT) usage. General Linear Model with Analysis of Variance (PROC GLM) was used to test the

difference of the Quick Response summation variables when grouped by the yes and no responses to the direct questions.

The relationships among the Quick Response factors were further examined with correlation techniques. The correlation procedure (PROC CORR) from SAS was performed on the 5 factors, and the 10 pair-wise sets were examined.

Using the General Linear Model (PROC GLM) with Analysis of Variance, the four demographic variables with Hypothesis 1a, 1b, 1c, and 1d were investigated for their influence on the Quick Response variables. Each demographic variable was tested independently. The probability level of .10 was used to determine statistical significance. This level is considered liberal but appropriate for the investigative nature of the research. The field of study has not been narrowed by any previous academic research.

If significant variance in the Quick Response measure was indicated by the PROC GLM and the F value, a follow-up investigation was executed using the Least Squared Means (LSM). Since a significant F value indicates only the general contribution of the variable to the variance, contrast statements are necessary. The effects of the different groups within each demographic variable were investigated. Using LSM, differences formed by individual degrees of freedom can be studied to determine the direction of the difference and the levels of the variable which are involved.

For Hypotheses 1a, 1b, 1c, and 1d, paired comparisons or contrast statements provided a distinction between levels of a demographic variable. If the F value from the PROC GLM was significant, the following comparisons were made: (a) men's wear manufacturers versus other categories of manufacturers, (b) large manufacturers versus small manufacturers, (c) basic good versus more seasonal goods, (d) large basic goods stores versus small limited line specialty stores, and (e) apparel manufacturers with retailers as channel captains versus other types of channel relationships.

Additional statistical analysis was done to reaffirm the study's findings about the relationships of the demographic variables with the Quick Response strategies of North Carolina apparel manufacturers. To further examine the structure of the Quick Response variable and the influence of the demographic variables, analysis of covariance (ANCOVA) was performed. ANCOVA permits a statistical control for preexisting differences and for concomitant variables in an ex post facto research problem (Ary, Jacobs, & Razavieh, 1985). PROC GLM with the homogeneity of slopes model statement was used for this analysis. The model was written to fit the relationship of classification variable with a continuous variable on a second continuous variable. The classification variable was

the demographic moderator, and the continuous variables were the Quick Response factors.

The effect of the model statement was to further examine the influence of the demographic variables as moderators on a Quick Response factor. If significant results indicated a confounding effect of the other Quick Response factors, additional analysis was performed with the separate slopes model with PROC GLM. This analysis examined the size and magnitude of the slopes of the significant pair-wise combinations of Quick Response factors across the levels of each demographic variable from Hypotheses 1a, 1b, 1c, and 1d.

Hypothesis 2 was investigated by comparing the variance in the Quick Response measure with the variance in the Change Factor variable. The Change Factor is a summation variable and was developed by squaring each of the change items from the questionnaire and totaling the numbers. Coefficients of correlation (PROC CORR) were used to analyze the relationship between the Change Factor variable and the five Quick Response factors. Plots of the correlation of the variables were used to reinforce the analysis.

CHAPTER IV

RESULTS

The sample was composed of apparel manufacturers in North Carolina. The respondents to the mailed questionnaire represented 47.5% of this sample. The demographic profile of the respondents included all sizes of manufacturing operations and manufacturers for the four major categories of target consumers. Requests for the executive summary came from 83% of the respondents. Analyses of data are presented under the following headings: (1) return rate for the survey, (2) demographic characteristics of the respondents, (3) the four hypotheses about company characteristics and Quick Response activities, and (4) the hypothesis about the Quick Response activities and the amount of change.

Return Rate for the Survey

The sample was stratified for size by numbers of employees and by the type of target consumer for which products were manufactured. These demographic features of the respondents were representative of these defined groups in the population. For comparison to the sample, the three original target consumer groups were considered without the fourth group. The categories of women and children were

represented in the same proportion as in the sample (see Table 6). The men's wear category was under represented in the respondent pool, but examination of the raw data indicated that the new category of multiple users consisted primarily of former men's wear companies.

All sizes of businesses participated in the survey and were represented in the same proportion as in the sample (see Table 6). The group of largest manufacturers, 500 or more employees, composed 13% of the sample and 15% of the respondents. The size group of 20-40 employees also compared favorably, because the group represented 18% of the sample and 17% of the respondents. The size group of less than 20 employees was small, less than 10 in that group, but this size group represents only 2% of the total North Carolina apparel manufacturers.

As shown in Table 7, 66 usable questionnaires were returned. The number of courtesy cards returned, 74, was higher than the number of returned questionnaires. Six additional surveys were returned, but these lacked enough completed questions to be included. If all of the demographic questions were unanswered, the remaining data from the questionnaire could not be used in analysis. The true return rate was 32.5%. The number of closed establishments made the adjusted return rate a more accurate measure of the rate. The adjusted return rate as described by Dillman (1978) is the number of returns divided by the

Table 6

Comparison of Respondents to Sample

Category	Sample	Respondents
Size	%	%
< 20	7	8
20- 49	18	17
50- 99	22	18
100-249	22	20
250-499	18	23
500+	13	15
Target Consumer	%	%
Men	36	25
Women	39	41
Children	24	33

Note. The group--men, women, and children--is omitted for comparison to the sample.

Table 7

Number of Questionnaires Returned Profiled by Target Consumer and Number of Employees

	Target Consumer					
Size	Men	Women	Children	M,W,C[a]	Total	%
< 20	0	1	0	4	5	8
20- 49	1	6	4	0	11	17
50- 99	1	4	3	4	12	18
100-249	5	3	1	4	13	20
250-499	4	3	5	3	15	23
500+	1	3	3	3	10	15
Total	12	20	16	18	66	100
%	18	30	24	27	100	

Note. [a]M,W,C = Men, Women, and Children

adjusted size of the sample. To adjust sample size, the ineligible and the nonreachable units, which are itemized in Table 8, were removed. The adjusted return rate was 47.5%.

Ineligible units included those businesses which refused to participate and those for which the questionnaire was determined not to be applicable. Of the eight units which were categorized as nonapplicable, two were not manufacturing apparel, and six were not considered to be a strategic business unit (SBU). These six units were missing one of Kotler's (1984) items for identifying SBUs: the managerial power to make independent marketing, sales, and production decisions for that single unit. Those units which were unable to participate and those which were unwilling to participate paralleled the sample in size of the businesses and in the target consumers reached. Both variables were fully represented in these groups.

Nonreachable units were businesses which had closed or had moved with no forwarding address or phone number. The address and phone number used was from a 1987-1988 (NC Department of Commerce, 1987a) listing and was considered current. The number of closed units was 47 which was 23% of the total sample (see Table 9). The rate of closed businesses for the sample was much higher than the 1.7% yearly rate of closing for eligible apparel businesses reported by AAMA (1987). All size and target consumer

Table 8

Number of Ineligible Businesses from Sample Profiled by Target Consumer and Number of Employees

Size	Target Consumer: Men	Women	Children	Total	%
Not Participate					
< 20	0	0	0	0	0
20- 49	1	0	0	1	11
50- 99	1	1	1	3	33
100-249	1	1	1	3	33
250-499	0	0	1	1	11
500+	0	1	0	1	11
Total	3	3	3	9	100
%	33	33	33	100	
Not Applicable					
< 20	0	1	0	1	13
20- 49	1	0	0	1	13
50- 99	2	0	0	2	25
100-249	0	0	0	0	0
250-499	0	2	0	2	25
500+	1	1	0	2	25
Total	4	4	0	8	100
%	50	50	0	100	

Table 9

Number of Closed Businesses from Sample Profiled by Target Consumer and Number of Employees

	Target Consumer				
Size	Men	Women	Children	Total	%
< 20	2	2	2	6	13
20- 49	4	5	1	10	21
50- 99	3	2	7	12	26
100-249	2	1	3	6	13
250-499	5	4	1	10	21
500+	2	0	1	3	6
Total	18	14	15	47	100
%	38	30	32	100	

categories were represented in the closed group. The closed businesses were in the same proportion as in the sample in size by number of employees and in the three target consumer categories except for the category of manufacturers of children's wear (see Table 9). The original sample contained 24% children's wear companies. The closed group contains a higher percentage of children's wear companies.

Demographic Characteristics of the Respondents

Frequency distributions for the size question as well as the other demographic questions were displayed by the PROC FREQ command with the SAS System (see Appendix C). Sample size (n) may vary with each analysis, because some respondents chose to omit certain questions.

As previously noted the units per level of size by number of employees paralleled the distribution of that variable in the sample. The moderate size levels contained more units than the smaller or larger size levels because of the number of units available in the accessible population. A direct correlation, as shown in Table 10, was seen between the number of employees of a company and the annual sales figures for that company. Companies with large numbers of employees had higher annual sales dollars than companies with fewer numbers of employees. The most common groups represented by the respondents were: 20-49 employees and less than $1M, 100-249 and $10-19.9M, 250-499 and $20-50M, and over 500 employees with over $50M.

Table 10

Percentages of Responses for Variables of Size by Annual Sales Dollars and by Number of Employees

	Number of Employees					
Annual Sales	<20	20-49	50-99	100-249	250-499	500+
< $1M	4.7	7.8	1.6	-	-	-
1- 1.9	1.6	-	4.7	1.6	-	-
2- 4.9	-	6.3	1.6	4.7	1.6	-
5- 9.9	1.6	-	6.3	4.7	1.6	-
10-19.9	-	-	1.6	7.8	6.3	-
20-50	-	-	1.6	-	7.8	6.3
50+	-	1.6	-	1.6	6.3	9.4

The profile of the retail customer was developed from the responses to the following questions: type of retail customers, size/ownership of retail customers, product lines of the retail customers, and relationship with the retail customers. For the majority of respondents, the retail customer was a large corporate chain with a mixed product line, containing both depth and breadth. The responses for type of chain were divided between department stores and mass merchandisers (see Figure 2). Apparel manufacturers with these types of retail customer responded most often that they follow, not lead, the retailer for changes in styling and product. Approximately one fourth of the respondents indicated that they did not have direct contact with retailers. These subcontractors dealt with other apparel manufacturers and jobbers.

The categories of target consumers for the questionnaire were expanded over the categories as itemized by the SIC codes. For the U.S. government data, target consumer is divided into the three categories of men, women, and children. Indications from previous studies were that a fourth category of all types and/or unisex styling was relevant to the apparel manufacturer. The results of the question on target consumer can be seen in Figure 3. The new category of manufacturers who target all consumer body types represented a fourth of the market for the respondents. A subset of this groups is the manufacturers

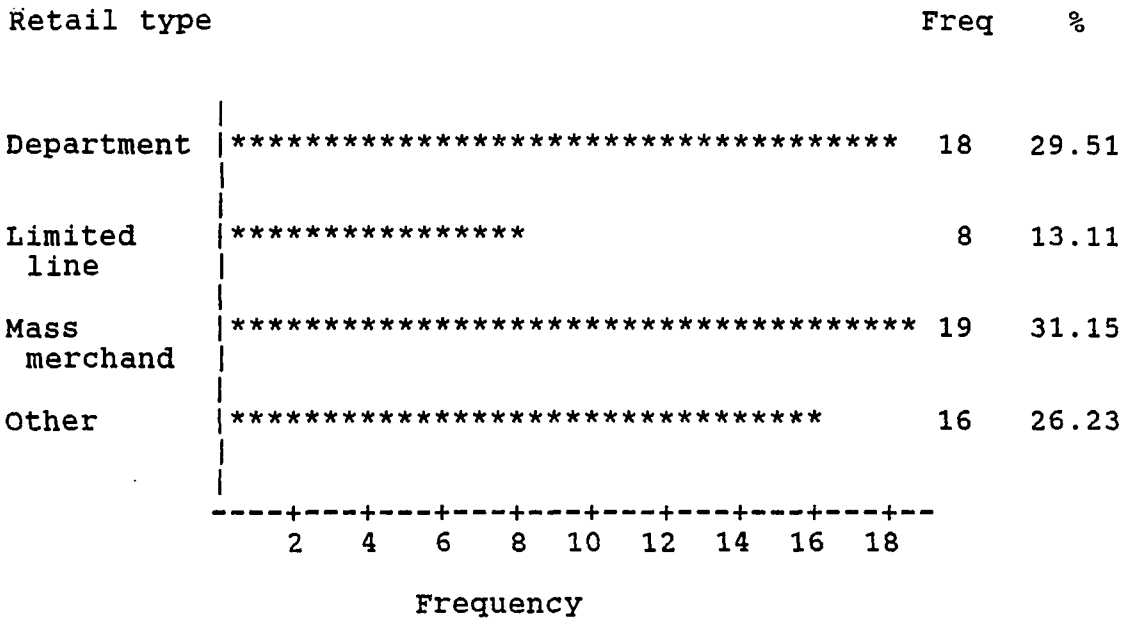

Figure 2. Histogram of the type of retail customers

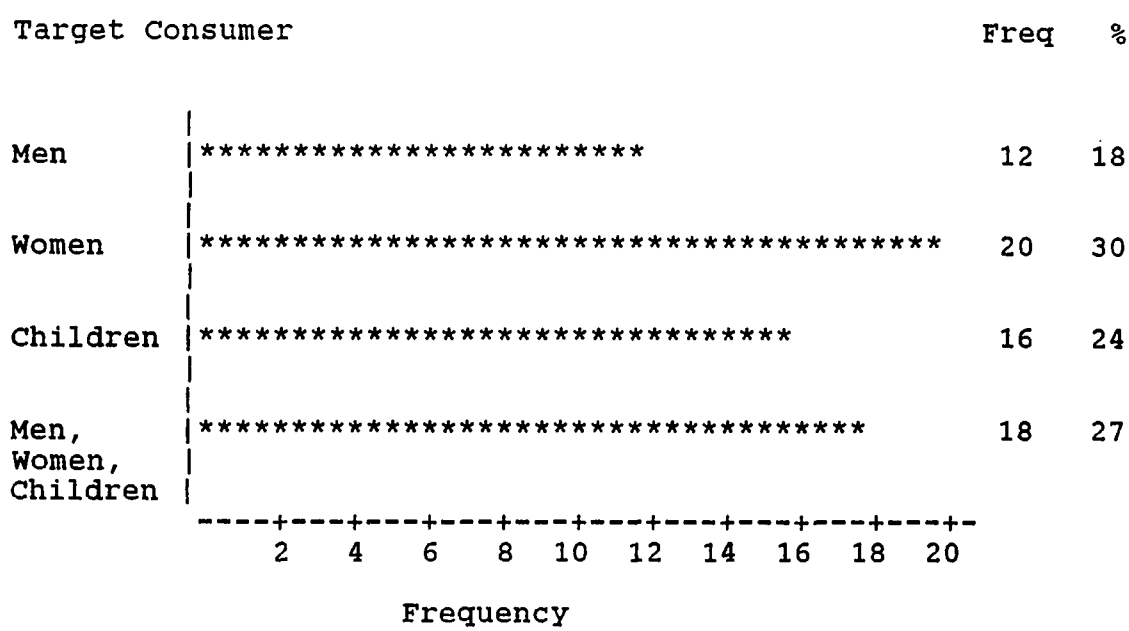

Figure 3. Histogram of the target consumer types

of printed and sporty T-shirts. These manufacturers are marketing to a much larger market than any of the manufacturers in the three traditional categories.

The product manufactured by the majority of the respondents was a basic product both in fashion styling and in length of selling season. Product information included the following questions: seasonality of the product line, price points for the apparel, fashion position of the product, end-use classification, and organizational location of the marketing function. Budget and moderate price points combined represented 75% of all apparel products manufactured by the respondents. The majority of these basic garments were shirts. At the other end of the fashion scale, only 3% of the respondents manufactured designer price garments with a corresponding 7% manufacturing high fashion styled garments. The proposed new category of continual, changing fashion with the season of less than 10 weeks was represented by only 4% of the goods (see Figure 4). The emphasis on basic goods corresponded to the 65% response rate of the marketing function as a subunit of the sales department and the 37% of retail customers from department stores or mass merchandisers.

More than 50% of the respondents chose categories other than the traditional SIC 23 code items. The terms specified for <u>other</u> included tops, bottoms, sweatsuits, jeans, and innerwear. Some of these items are industry terms for more

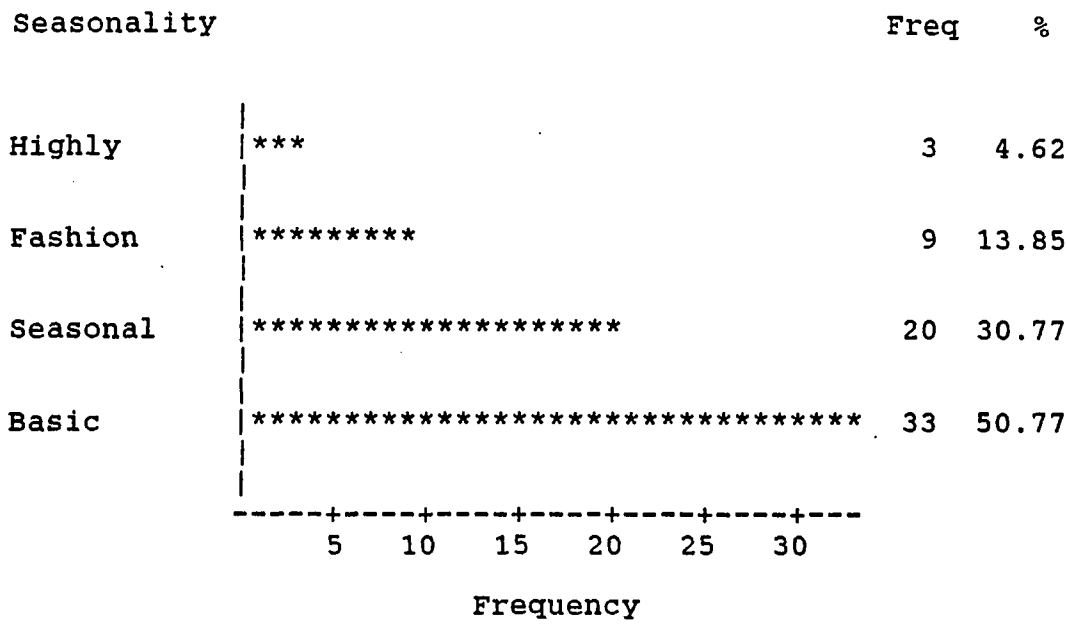

Figure 4. Histogram of categories of seasonality for the product

traditional phrasing in the codes. A parallel between SIC terms and respondents' terms could not be established for some items. Terms without direct counterparts in the SIC codes are athletic wear, playwear, separates, and sportswear.

The corporate profile was complied from the following questions: production planning, return on investment and productivity. This profile revealed that 60% of the responding manufacturers had product planning done by the central administration. The results for the question on decisions for return on investment (ROI) for capital expenditures formed a dipolar split between the need for short term profitability and the consideration of short term losses for long term gains. A similar split was found between the techniques used for determining productivity. Total productivity of the plant was used by 37.5% of the respondents with most of the others choosing direct labor costs as their measure for productivity.

The distribution of the respondents over the categories of size by number of employees and type of target consumer closely resembled the proportions of those groups in the sample. The sample had been selected from the population of North Carolina apparel manufacturers by stratified random selection. In both the sample and the respondents, each target consumer group represented one third of the total population. The categories of size have a similar parallel

with the sample. For example, the size, 100-249 employees, constituted 22% of the sample and 20% of the respondents. This equal proportioning was parallel to the original stratification of the accessible population for comparison purposes.

Definition of Quick Response

One of the objectives of the study was to define the morphology of Quick Response for the textile/apparel/retail complex. The findings from the review of literature were inconclusive about the definitions for Quick Response. Section I, Operational Procedures, of the mailed questionnaire was a listing of activities which were considered to be indications of Quick Response manufacturing operations. Section I contained 17 different activities which were identified through the review of literature and from interviews to be pertinent activities in increasing a company's responsiveness to the market.

Only four respondents indicated no Quick Response type operations for their manufacturing facility. No respondent had the maximum score which would have occurred with a response of 100% usage of each activity. All 17 Quick Response activities had at least 15% of the respondents indicate some usage. The Quick Response activities showing the highest usage were reduction of wait time for inventory, elimination of redundant testing, and short cycle production.

A Quick Response Quotient was derived by totaling each sample unit's response to the questions in Section I of the mailed questionnaire. With the information gathered from the face-to-face interviews and the review of literature, the researcher anticipated a bimodal distribution for the Quick Response Quotient. As shown in Figure 5, the actual Quick Response Quotient distribution was a slightly skewed bell-shaped curve with the range of 0 to 1500 and the mean of 478.79. The maximum potential score was 1700. The mode was 500 with 7 observations. Thirty-one different Quick Response Quotient scores were noted which created a continuum instead of a grouping of users and nonusers. Further analysis was deemed necessary, because the Quick Response Quotient responses represented a wide range without the expected pattern.

For the development of a more reliable Quick Response measure, the Quick Response activities, Section I data, were further analyzed with Principle Components Method of Factor Analysis with Varimax Rotation (PROC FACTOR) from SAS. This procedure was performed to determine the existence of any underlying constructs. This treatment examines all variables with equal emphasis and tests for underlying constructs. If the summation variable was homogeneous, all items would load on only one factor; however, five orthogonal factors resulted from the factor analysis (see Table 11).

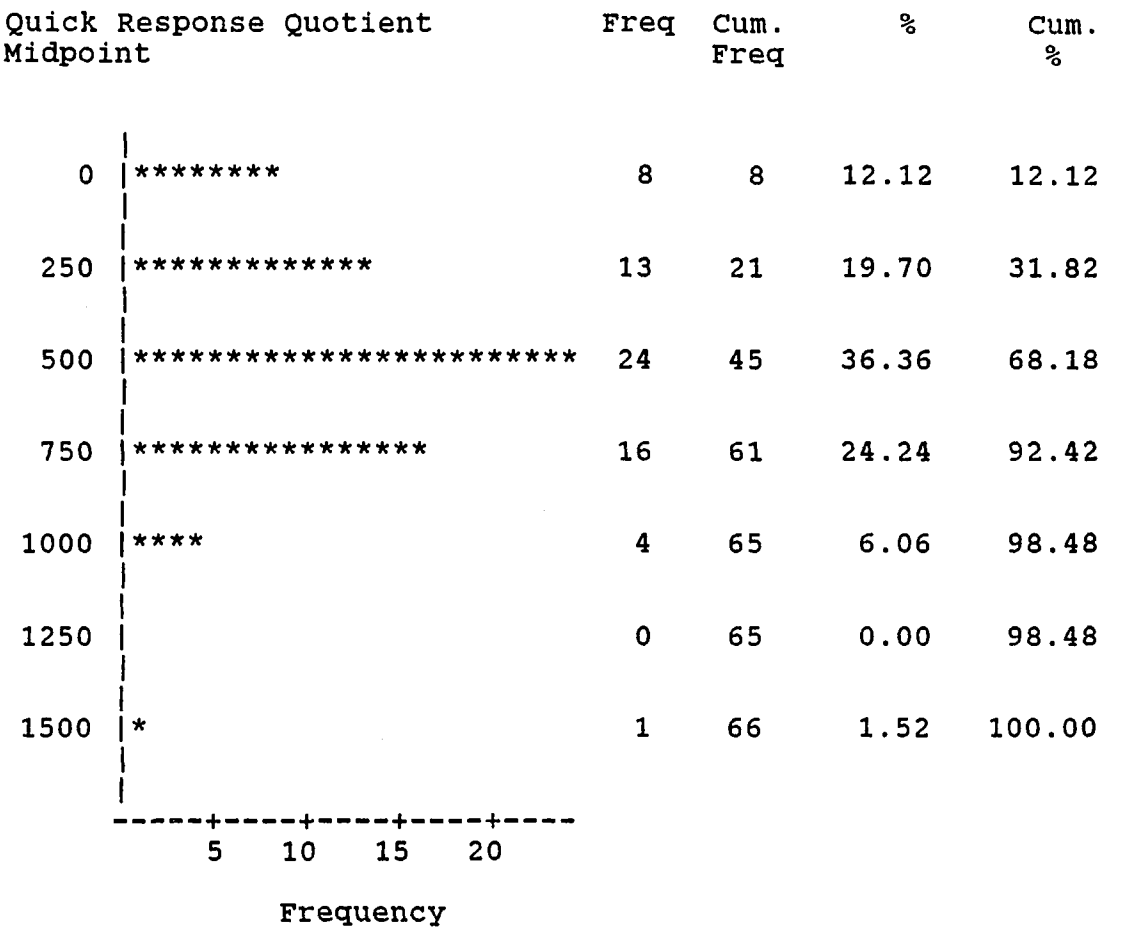

Figure 5. Histogram of Quick Response Quotient scores

Table 11

Factor Loading of the Quick Response Activities From Section I of the Mailed Questionnaire

Factor	Loadings	Alpha
1. Inventory Control		.79
Reduction of inventory	.69	
Small lot orders	.66	
Wait time for inventory	.65	
Reduce redundant testing	.78	
Short cycle production	.75	
2. Information sharing		.74
Share product information	.72	
EDI-orders with suppliers	.82	
Garment dyed products	.62	
3. Bar Coding		.62
Scan fabric roll bar codes	.77	
Overhead conveyor	.68	
Bar codes for garments	.68	
4. Product Planning		.41
CAD garment design	.55	
Plan product with customer	.77	
5. Shade Sorting		
Use of roll shade shorting	.85	

Factor loadings generated by the PROC FACTOR were evaluated. Individual items, which loaded higher than .55 on that factor and lower than .36 on the other factors, were retained. Such items were clearly loading on only one factor and were considered orthogonal. Of the 17 activities, 14 were significantly loaded on the factors. The items, POS linkage, EDI-orders with customer, and automated sewing, did not show a strong relation to any single factor. These items were eliminated from further analysis. The resulting factors were distinct and definable. The Quick Response factors appeared to represent different dimensions of the Quick Response movement as reviewed in industry literature and interviews. Factor loadings for individual items are listed in Table 11.

To judge the strength of their measurement of the underlying constructs, the five factors were also tested for reliability. Each factor which contained more than one item was tested with the Reliability program in SPSS-X. Three of the factors, Factor 1, 2, and 3, had alpha values above .6, and were considered excellent measures of the indicated constructs (see Table 11).

Factor 4 and Factor 5 contained fewer items, because these factors represented a more narrow focus than the other Quick Response factors. The fourth factor contained only 2 items and had a subsequent alpha value of .44. Although the alpha coefficient was low, this factor was retained, because

it was the only factor to contain the Quick Response technique of Computer Aided Design (CAD). The CAD technique was shown by the Kosh study (1988) to be a frequent Quick Response tool. The fifth factor contained only one item and could not be tested for reliability. Although without a reliability test, this factor was retained, because the item was shade sorting which is one of the foremost Quick Response techniques promoted by the Textile Apparel Linkage Council (TALC) (1987).

Factor 1 was labeled Inventory Control. Five items were retained in this factor with the items loading between .66 and .78. Apparel manufacturers who scored high on this factor were active in the reduction of inventory size. Related to the action of actual reduction of the inventory size are the techniques of small lot orders and short cycle production. These techniques require less inventory at any one time for the same volume of production. Manufacturers using these techniques also scored high on the reduction of wait time and reduction of duplicate testing. Both activities are designed for moving the textiles quickly from textile manufacturing to cutting room tables in the apparel operation (TALC, 1987).

Factor 2, Information Sharing, was composed of four individual activities with factor loadings between .61 and .71. Information Sharing represents the dimension of Quick Response promoting improved communication between suppliers

and customers. Apparel manufacturers who scored high on this factor used Electronic Data Interchange (EDI) to confirm order with suppliers. Included in this factor was the activity of sharing product information between suppliers and customers. Garments dyed at customer request is a specific example of information sharing between apparel manufacturers and the retail ("Garment dyeing", 1987). Use of POS information, another specific example of information sharing, was expected to load on Factor 2 but did not load on this factor.

Factor 3, labeled Bar Coding, retained three of the individual Quick Response items with factor loadings between .67 and .77. Activities in this area require specialized equipment. Apparel manufacturers with high scores on this factor used the bar coding equipment to read the bar codes on fabric rolls and to print the codes on finished garments. These manufacturers also used the automated device of overhead conveyers for movement of either finished garments or of cut parts.

Factor 4, Product Planning, was composed of two items with loadings of .55 and .76. Apparel manufacturers who were involved with their customer in planning the product scored high on this factor. These apparel manufacturers indicated high levels of usage of the Computer Aided Design (CAD) systems when designing garments.

Factor 5 was labeled Shade Sorting. One Quick Response activity with a loading of .84 was retained for this factor. The apparel manufacturers, who scored high on the Shade Sorting factor, used computerized shade sorting information for the matching, layout, and cutting of fabric rolls.

The PROC FACTOR program from SAS resulted in five Quick Response factors instead of the expected one summation measure. The results of the factor analysis indicated that Quick Response is not a single homogeneous concept but rather a multifaceted movement in the industry. The heterogeneity of Quick Response indicated that the five factors, and not the summation Quick Response Quotient variable, should be used to represent the Quick Response variable in further statistical analyses. All hypotheses were tested with each of the five factors.

Further validation of the multifactor Quick Response construct was undertaken with the testing of the Quick Response factors with the responses for the direct questions about Quick Response and Just-in-Time (JIT). The means of the Quick Response factors were tested for the differences between yes and no response groupings. General Linear Model (PROC GLM) with Analysis of Variance (ANOVA) was performed using the five Quick Response Factors and the two direct questions. A relationship was observed between the Quick Response question and two of the factors. Three factors did vary directly with the JIT responses and a fourth factor

approached significance. All of the factors had significant differences, or the differences approached significance, with grouping by either the Quick Response question or the JIT question (see Table 12). Complete statistical tables including sample size and standard error for the GLM procedures are contained in Appendix D.

Both the Product Planning factor and the Shade Sorting factor had significant differences ($p > .05$ and $p > .10$) with the levels of the Quick Response question. The means of the Product Planning factor varied with the levels of the Quick Response question. The Quick Response activity rate for yes responses was almost twice as high as the mean rate for the no responses (see Table 13). For the Shade Sorting factor the reverse relationship was true. A high score was associated with the no responses, and a low mean score was associated with yes responses to Quick Response activity. This reverse relation was unexpected, because TALC (1987) has promoted shade sorting for increasing responsiveness.

The concept of JIT, represented by the question about JIT usage, was associated with the variance in three Quick Response factors, Inventory Control, Bar Coding, and Product Planning (see Table 12). For these factors, the mean of the yes responses were higher by 2 to 1 ratio than the mean of the no responses (see Table 13). The factors involving inventory control and bar coding concern procedures which were directly associated with reducing the amount of time

Table 12

ANOVA of Quick Response Factors for the Questions about Quick Response and Just-in-Time

Factor	Quick Response F	Just-in-Time F
Inventory Control	1.48	5.15**
Information Sharing	0.05	2.30[a]
Bar Coding	0.58	4.15**
Product Planning	4.23**	6.13***
Shade Sorting	3.26*	0.24

Note. [a] $.11 < p < .15$

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 13

Mean Scores of Quick Response and JIT Questions on the Five Quick Response Factors

	Quick Response		Just-in-Time	
Factor	Yes	No	Yes	No
Inventory Control	44.09	35.95	52.89	37.59
Information Sharing	25.99	26.98	33.77	23.06
Bar Coding	15.72	11.11	23.68	11.05
Product Planning	26.99	14.28	34.87	18.60
Shade Sorting	29.55	46.43	32.89	37.79

goods stay in the pipeline. This reduction in time and in volume of inventory is the definition of JIT (Weintraub, 1987a); therefore, these factors were expected to relate positively to yes responses to the JIT question.

All of the five Quick Response factors except the Information Sharing factor had significant variance with either the Quick Response or the JIT question, and the Information Sharing factor approached significance. The failure of the Information Sharing factor to show statistically significant differences in conjunction with either Quick Response or JIT is in harmony with the industry's failure to develop effective communication between trading partners and the industry's reluctance to share trade information.

Additional analysis with frequency distributions (PROC FREQ) was performed to investigate the relationship between the Quick Response and JIT questions. JIT is considered by some members of industry to be the equivalent of Quick Response, and other industry officials see JIT as a subset of Quick Response (T. Kerr, Customer Service Manager, Cone Mills Corporation, personal communication, 1988). As shown in Table 14, the frequencies did form a relational pattern. Ninety-five percent of the yes responses for JIT corresponded to a yes response to Quick Response. According to the responses of apparel manufacturers, JIT is shown to be a well defined subset of the Quick Response movement.

Table 14

Frequency Distribution of Responses for Quick Response and JIT

Quick Response	JIT		Total	%
	Yes	No		
Yes	18	23	41	66
No	1	20	21	33
Total	19	43		
%	30	69		

To further define the Quick Response variable, PROC CORR was performed with the five Quick Response factors. Pairs were formed with combinations of the five factors, and the ten distinct pairs were tested for correlation. Five of the ten pairs had significant correlation coefficients ($p < .005$). The existence of these correlations added support to the conclusion that the Quick Response strategy is structured as a multifactor variable.

The Four Hypotheses about Company Characteristics and Quick Response Activities

The data from the mailed questionnaire were analyzed to determine which variables were significant moderators in relation to an apparel manufacturer's implementation of Quick Response. With the use of General Linear Model (PROC GLM) with Analysis of Variance (ANOVA) and the information about Quick Response from Section I, the following four hypotheses were investigated. The target consumer (men/boys, women/girls, children/infants, and multiple types) of the apparel manufacturer's product has no relationship to the level of Quick Response (Hypothesis 1a). The size of the manufacturing operation as measured by the number of employees and by the annual sales volume has no relationship to the level of Quick Response an apparel manufacturer uses (Hypothesis 1b). The seasonality of the goods as described by the three U.S. Department of Commerce's categories and the fourth industry category has

no relationship to the level of Quick Response which an apparel manufacturer has achieved (Hypothesis 1c). The retail customer, who is described by type, size/ownership, and relationship to supplier and who purchases the product of the apparel manufacturer, has no relationship to the manufacturer's use of Quick Response (Hypothesis 1d).

Analysis with PROC GLM was conducted with each of the five factors and the demographic moderator variables identified by the hypotheses. Four of the seven demographic variables showed significant involvement with the variances of the Quick Response factors. Each of the significant demographic variables was related to two or more of the Quick Response factors. This influence accounted for some change in four of the five Quick Response factors. Complete ANOVA tables including standard error and sample size are located in Appendix D. With the five factors and the demographic variables, 35 analyses were made with PROC GLM, and 20% of these tests were significant.

The means for individual levels within the significant variables were further analyzed with the use of Least Square Means (LSM) and contrast statements. A significant F value indicates only a variance with the levels of each demographic variable but not the direction or amount of difference for individual treatment groups. Descriptive statistics were used to determine mean, range, and variance for different strata of the sample population. For level

and direction of significance, paired comparisons and contrasts were made and tested with the method of Least Significant Means (LSM).

Relationship of the target consumer to the manufacturer's level of Quick Response. The influence of the type of target consumer on the Quick Response activity of the manufacturer was examined with Hypothesis 1a. The four categories of target consumer used for analysis were men, women, children, and multiple types (men, women, and/or children). These four groups were a reduction of items from the questionnaire. Prior to data reduction, analysis of the raw data for the demographic question on target consumers indicated little variance between the subgroup pairings of men and men/children; women and women/children; and men/women and men, women, and children.

With the four categories of target consumers, PROC GLM was used to determine contribution of target consumers to the variance in the Quick Response factors. Both the Product Planning factor and the Shade Sorting factor were significant below the 0.10 level (see Table 15). Based on this evidence the hypothesis of no difference of Quick Response activity among manufacturers for groups of target consumers was rejected.

The factor scores were grouped by the target consumer types, and the factor mean scores for the significant

Table 15

F Values from ANOVA of Quick Response Factors for Significant Demographic Moderators

Quick Response Factors	Demographic Moderators			
	Target Consumer	Size Employee	Size Sales	Retail Relation
Inventory Control	0.40	2.18*	2.14*	1.87a
Information Sharing	0.59	0.47	1.62a	0.24
Bar Coding	1.15	0.60	1.07	2.68**
Product Planning	2.35*	0.43	0.83	0.39
Shade Sorting	2.44*	2.36*	2.04*	0.28

Note. a $.11 < p < .15$

* $p < .10$ ** $p < .05$

factors were examined (Table 16). Planned comparisons of the groups were made using LSM and the t statistic. The resulting probabilities for the target consumer group contrasts are listed in Table 17. The planned contrasts between manufacturers of men's wear and other categories of manufacturers were analyzed. The means for Quick Response activity of the Product Planning factor were higher at 2 to 1 for men's wear manufacturers over women's wear manufacturers ($p < .025$). Also significant was the contrast of men's wear manufacturers to children's wear companies ($p < .05$). This finding is compatible with the lower number of stock keeping units (SKUs) offered by men's wear manufacturers in opposition to the higher SKUs and faster turns for women's wear (Wilson, 1987). With fewer SKUs, men's wear manufacturers can spend more time with each customer, have more opportunity to perfect the CAD techniques, and can allow time for jointly planning the product line. Men's wear manufacturers utilize more automated equipment including the use of Computer Aided Design systems.

The same contrasts were made for the significant Shade Sorting factor, but the expected results were not found. For the Shade Sorting factor, the men's wear manufacturers did not have the highest mean score; instead, children's wear manufacturers' mean score was 60% higher than means for all categories and was significantly different ($p < .01$)

Table 16

Mean Scores of Target Consumer Groups on the Significant Quick Response Factors

	Target Consumer Groups			
Quick Response Factors	Men	Women	Children	M,W,C[a]
Product Planning	34.38	15.00	17.19	27.78
Shade Sorting	33.34	35.00	54.69	22.22

Note. [a]M,W,C = Men, Women, and Children

Table 17

P Values for Contrasts Between Target Consumer Groups on the Significant Quick Response Factors

Quick Response Factor	Men vs. Women	Men vs. Children	Men vs. M,W,C[a]
Product Planning	.025	.056	.447
Shade Sorting	.898	.118	.402

Note. [a]M,W,C = Men, Women, and Children

from both the men, women, and children group and the combined scores of the men; women; and men, women, and children groups. Shade sorting is important to apparel manufacturers who produce high volumes of basic goods. This description would indicate high usage of the Shade Sorting factor by men's wear; however, men's wear manufacturers' scores were not significantly higher. Shade sorting is also a critical factor in quality control when multiple plants are involved in manufacture of different units for matching coordinates (J. Koonce, Director of Cone Mills Corporation Technical Center, personal communication, 1988).

Relationship of the size of the manufacturing operation to the level of Quick Response for apparel manufacturers. Hypothesis 1b dealt with the variable of size and that variable's influence on usage of Quick Response techniques. Size was examined with the numbers of employees per manufacturing facility and with the gross annual sales volume of a manufacturing operation. PROC GLM for the levels of employees was performed using each of the five Quick Response factors. When grouped by size categories as measured by number of employees, the mean scores for the Inventory Control factor and the Shade Sorting factor displayed significant differences ($p < .10$) (see Table 15). The rejection of the hypothesis of no influence of size of manufacturing operation on the level of Quick Response activity was based on these values.

The influence of size as defined by the amount of annual sales volume was also tested. When analyzed with PROC GLM, two factors, Inventory Control and Shade Sorting, had significant F values ($p < .10$) with the different levels of annual sales amounts (see Table 15). These significant factors were the same two factors which had significant variance with the first measure of size. These results imply that firms with high sales volume as measured in dollars have more activity with Quick Response, as represented by the factors of Inventory Control and Shade Sorting.

Both of these activity areas respond positively to the techniques of economies of scale and yield higher return value with higher volume of production. The significant differences of Quick Response factor scores found among the categories of annual sales volume further supported the decision to reject the hypothesis of no influence from size on an apparel manufacturer's Quick Response activity level.

To determine the exact location of the significant differences, the factor mean scores for the levels of employee groups were examined. Paired comparisons were made between the small size plant group and each of the larger plant groups. The LSM for the Inventory Control factor revealed differences in Quick Response activity for the pairs of size groups (see Table 18). The LSM for these pairs were tested with the t statistic. The means for the

Table 18

Mean Scores of Size by Number of Employee Groups on the Significant Quick Response Factors

	Size by Number of Employees					
Factors	< 20	20-49	50-99	100-249	250-499	500+
Inventory Control	49.00	24.09	31.25	44.16	47.33	52.00
Shade Sorting	0.00	22.73	39.58	44.23	33.33	57.50

manufacturing operations employing 20 to 49 employees were significantly different from the mean factor score for manufacturers of several larger size groups (see Table 19). The difference between the small size manufacturers (20-49 employees) and the largest manufacturers (500 or more employees) was significant ($p < .01$).

For the mean scores of the Shade Sorting factor, differences were also found between the smaller size manufacturers and the large manufacturers. The smallest manufacturers indicated no activity in the areas represented by the Shade Sorting factor. The largest manufacturers had the highest mean score of 57.5 (see Table 19). Pair-wise comparisons were made for different sizes of manufacturers. When tested with the t statistic, the comparisons of the LSM factor scores of the small manufacturers and the larger manufacturers were statistically significant. The comparison between the smallest manufacturers (less than 20 employees) and the largest manufacturers (500 or more employees) was significant below the .005 level.

The finding of differences in Quick Response usage between small and large manufacturers is consistent with the opinions of J. William, president of the National Retail Merchants Association (Haber, 1988). He said that Quick Response techniques are used more by the large retailer and large apparel manufacturer. He found that smaller companies

Table 19

P Values for Contrasts Between Size by Number of Employee Groups on the Significant Quick Response Factors

Number of employees	p Value
Inventory Control	
20-49 vs. < 20	.065
20-49 vs. 50-99	.488
20-49 vs. 100-249	.045
20-49 vs. 250-499	.020
20-49 vs. 500+	.012
Shade Sorting	
< 20 vs. 20-49	.229
< 20 vs. 50-99	.036
< 20 vs. 100-249	.019
< 20 vs. 250-499	.068
< 20 vs. 500+	.004

do not have the capital to invest in the needed equipment for Quick Response programs.

For the significant factors, the mean factor scores for the categories of levels of sales were examined (see Table 20). The difference between the mean factor scores for large manufacturers (above $20M) and small manufacturers (below $1M) was significant for the Inventory Control factor scores ($p < .01$) and for the Shade Sorting factor scores ($p < .05$) (see Table 21). For both methods of measuring size (numbers of employees and sales volumes), larger firms exhibited higher levels of Quick Response activity within selected factor types.

Relationship of the seasonality of goods to the level of Quick Response which an apparel manufacturer has achieved. Hypothesis 1c examined the influence of seasonality of goods on a manufacturer's use of Quick Response. Seasonality was described by four categories: highly seasonal, fashion, seasonal, and basic. The highly seasonal category is defined by the industry, and the other three categories are defined by the U.S. Department of Commerce. Examination of the effect of seasonality with PROC GLM and the five factors failed to reveal any significant relationships. Hypothesis 1c was not rejected; however, an overall pattern among means was observed.

Excluding the highly seasonal goods, manufacturers of basic goods had higher mean scores of Quick Response

Table 20

Mean Scores of Size by Annual Sales Dollars Groups on the Significant Quick Response Factors

	Size by Annual Sales Dollars						
Factor	< 1M$	1-1.9	2-4.9	5-9.9	10-19.9	20-50	50+
Inventory Control	19.44	33.00	45.00	44.44	41.00	52.00	51.67
Information Sharing[a]	21.29	6.67	22.22	34.41	44.17	20.83	26.39
Shade Sorting	5.56	20.00	38.89	44.44	35.00	37.50	54.17

Note. a denotes factor that approaches significance

Table 21

P Values for Contrasts Between Size by Annual Sales Dollars Groups on the Significant Quick Response Factors

Annual sales dollars	p Value
Inventory Control	
< 1M$ vs. 2-4.9	.026
< 1M$ vs. 5-9.9	.029
< 1M$ vs. 10-19.9	.053
< 1M$ vs. 20-50	.004
< 1M$ vs. 50+	.003
Shade Sorting	
< 1M$ vs. 2-4.9	.043
< 1M$ vs. 5-9.9	.019
< 1M$ vs. 10-19.9	.067
< 1M$ vs. 20-50	.047
< 1M$ vs. 50+	.002

activity than manufacturers of fashion and highly seasonal goods (see Table 22). The lack of a significant difference between usage of Quick Response for manufacturers with frequent seasons and manufacturers with single season goods may be explained by the smaller sample size and the larger standard error for the manufacturers of highly seasonal goods. The manufacturers of highly seasonal goods represented less than 5% of the total number of manufacturers and had consistently higher standard errors than other categories.

Relationship of the type of retail customer to the level of Quick Response of a manufacturer. The fourth hypothesis about the moderating factors and the Quick Response levels of apparel manufacturers involved the variable of retail customer (Hypothesis 1d). The retail customer purchases the product from the apparel manufacturer. The type of customer, the size/ ownership of the customer, and the relationship between customer and manufacturer were used to operationalize the variable of retail. The three different measures of retail customers were individually analyzed with PROC GLM for their contribution to the variance in the five factors.

The categories of type of retail operation and the size/ownership of the retail operation did not discriminate among the levels of Quick Response activities. The finding of no significant difference among types or size/ownership

Table 22

Mean Scores of Seasonality of Product on the Five Quick Response Factors

	Seasonality of Product			
Quick Response Factors	Highly	Fashion	Season	Basic
Inventory Control	30.00	36.11	40.75	43.94
Information Sharing	11.11	12.96	25.00	31.31
Bar Coding	19.44	1.85	12.92	17.49
Product Planning	20.83	12.50	17.50	29.17
Shade Sorting	33.33	33.33	42.50	34.09

of retail customers for Quick Response activity indicated that manufacturers use similar Quick Response methods regardless of the organizational characteristics of their retail customers.

Analysis of the differences among Quick Response factor mean scores for the relationship between retailers and manufacturers groups did result in a significant F value ($p < .05$) with the factor on Bar Coding (see Table 15). The factor involving Inventory Control techniques approached significance ($.11 < p < .15$). This may mean that the apparel manufacturer's use of bar coding on fabric rolls or on finished garments is related to their perceived relationship with their retail customers. The evidence exists that an aspect of the retail customer has a relationship with the variance in the Quick Response level of an apparel manufacturer's operation. Hypothesis 1d of no influence of retail customer on the level of Quick Response achieved by an apparel manufacturer was rejected.

The location of the significant differences among the customer relationship groups was examined with LSM and the t statistic. The means for each grouping of the question on retail customer relationship are listed in Table 23. For the factor, Inventory Control, the Quick Response activity mean for leaders was higher and significantly different ($p < .05$) from followers (see Table 24). This finding is inconsistent with the opinion of Braden, Holford, and

Table 23

Mean Scores of Relationship with Retailer on the Significant Quick Response Factors

	Relationship with Retailer			
Quick Response Factors	Lead	Follow	Ignore	Other
Inventory Control[a]	54.72	38.23	45.00	39.38
Bar Coding	22.22	10.78	41.67	2.08

Note. a denotes factor that approaches significance

Table 24

P Values for Contrasts Between Relationship with Retailer Groups on the Significant Quick Response Factors

	Relationship with Retailer		
Quick Response Factor	Follow vs. Lead	Follow vs. Ignore	Follow vs. Other
Inventory Control	.024	.786	.906
Bar Coding	.063	.147	.289

Richardson (1987) that retailers are the leaders for the decisions of type and amount of Quick Response usage. These results may mean that the apparel manufacturer is the channel captain for some decisions about Quick Response.

The significant variance ($p < .05$) in the Bar Coding factor was attributed to the categories of Ignore, Lead, and Other, not to the expected comparison of Leaders to Followers. The category of Ignore contained only one respondent, and the responses of Others was divided between Not Applicable and a mixture of Lead and Follow. No clear direction was found with the results of the analysis for this portion of the hypothesis about retailer's influence. This is in conflict with the findings from the study performed by Kurt Salmon Associates for the Du Pont Company (Gillease, 1988b). Gillease concluded that Quick Response linkages were initiated by the retailer and that the manufacturer would be the follower.

To reaffirm the results of the hypotheses about the effect of the demographic variables as moderators on the Quick Response factors, ANCOVA was conducted. PROC GLM with the homogeneity of slopes model was used. In testing the number of relationships, all possible combinations between pairs of the five Quick Response factors and the levels of the seven demographic variables were validated. Out of the 70 combinations used for ANCOVA tests, 27 combinations were significant at the .025 level. An additional 2 combinations

were significant at the .05 level. The total statistically significant differences from the ANCOVA accounted for 41% of the tested combinations, and paralleled the differences found with the PROC GLM with ANOVA.

The significant combinations were further tested with the separate slopes model with PROC GLM to examine the characteristics of the slopes. Additional significant findings across the levels of the demographic variables were further evidence of the interaction of the Quick Response factors and the demographic variables. The morphology of Quick Response does differ with the change in levels of the demographic variables. These results reaffirm the findings of the PROC GLM with ANOVA and will be more closely analyzed for the effects of demographic variables on an apparel manufacturer's choice of Quick Response strategies.

The Hypothesis About the Quick Response Activities and the Amount of Change

Implementation of the Quick Response strategy, as measured by the production and distribution techniques of an apparel manufacturer, had no corresponding relationship to changes in the product line or customer services offered by the company (Hypothesis 2). The data from the mailed questionnaire were also analyzed to identify changes in the augmented product which were correlated with the production and distribution methods associated with Quick Response. A summation score for amount of change was developed from the

raw data. This Change factor score was developed by squaring the responses for each item indicated on the two change scales and totaling the score for each respondent. Additional descriptive statistics were used to examine any significant relationships which were the results of these analyses. This score was used in a correlation analysis of (PROC CORR) to examine the amounts of change perceived by apparel manufacturers.

The Change factor score was derived for each manufacturer. As shown in Figure 6, the Change factor scores ranged from a low score of 0, indicating no overall change, to the high score of 39. The potential maximum score was 52. Two items, quality of product and customer contacts, showed only positive changes. All other items showed both increases and decreases in direction of change. Product seasons showed the least amount of change.

Through the use of correlation analysis, the degree of relationship between the levels of Quick Response implementation and the amounts of change found in the augmented product, as represented by the Change factor was investigated. PROC CORR between the Change factor and the five factors was conducted and resulted in three factors showing significant relationships with Change factor (see Table 25).

The correlation between the Inventory Control factor and the amount of identified change was significant to the

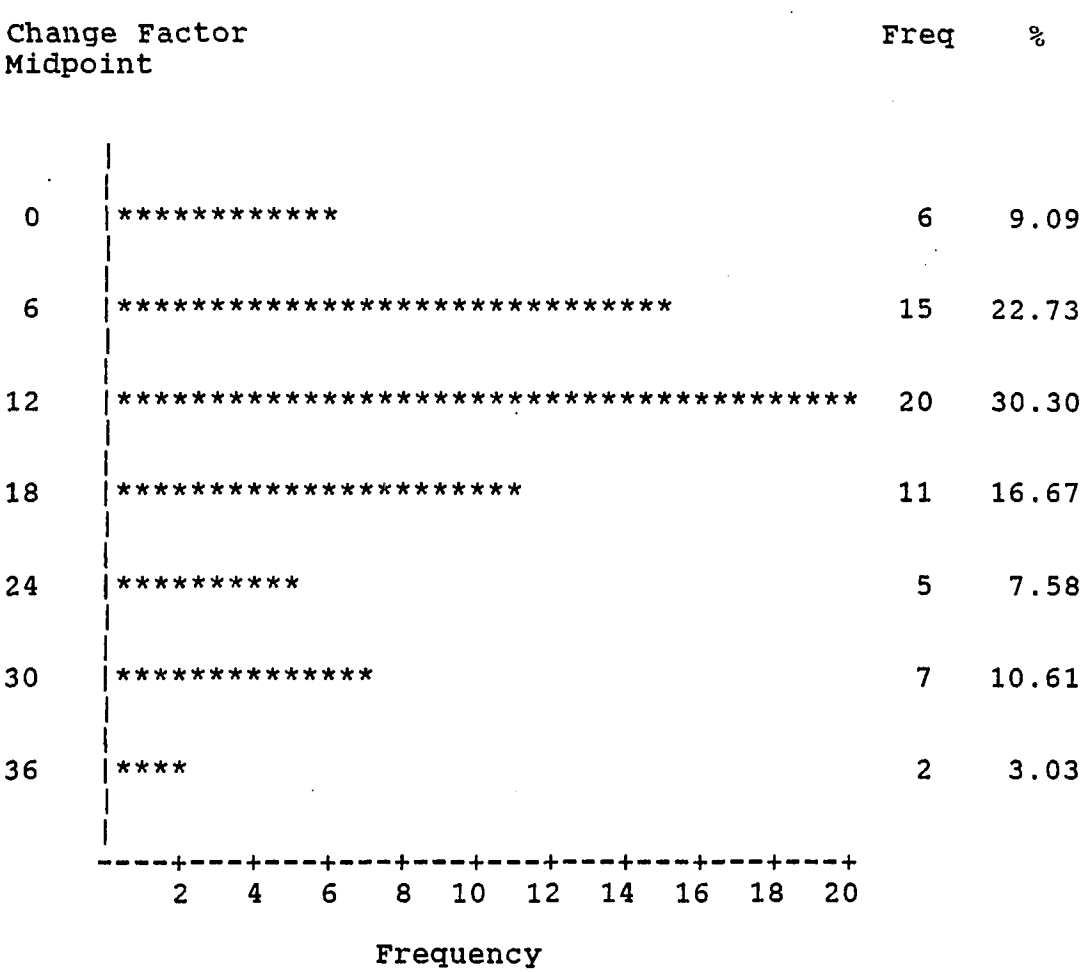

Figure 6. Histogram of the amount of change as perceived by apparel manufacturers

Table 25

Pearson Correlation Coefficients with Quick Response Factors and Change: Hypothesis 2

Quick Response Factor	Change Factor
Inventory Control	.38***
Information Sharing	.13
Bar Coding	.10
Product Planning	.25**
Shade Sorting	.20*

Note. * $p < .10$ ** $p < .05$ *** $p < .001$

.001 level. Increases in the use of inventory control methods correlated positively with increased change for the apparel manufacturer. This correlation may mean that apparel manufacturers who adopt new techniques of inventory control may change the way their company interacts with their customers. The new techniques may also change the price, style, or seasonality of their product. Automation of inventory control is more cost effective if the product is standardized (Thome, 1986). The apparel industry has not been standardized; therefore, a movement to automation would require many changes in product and customer services.

The factor, Product Planning, correlated positively with the amount of change perceived by an apparel manufacturer ($p < .05$). Industry opinion supports this finding. Product planning with the customer requires a long term commitment and an operational organization that many traditional manufacturers do not have (Palmieri, 1987, November 11). The factor, Shade Sorting, had a significant ($p < .10$) and positive correlation with the amount of change. The increases in levels of usage of Shade Sorting were in 25% increments for the respondents and positively correlated with increased change experienced by these manufacturers. The use of shade sorting information becomes more important to manufacturers as volume, diversity of location, and automation increase (J. Koonce, personal communication, 1988).

These significant tests may mean that the type and volume of Quick Response techniques used by apparel manufacturers may affect the marketing techniques used by the company. This finding is consistent with the prediction by J. Bakane (personal communication, 1987), Vice President of Cone Mills Corporation, that apparel companies with high involvement in Quick Response will experience changes in their augmented product.

Of the five Quick Response factors, three factors exhibited significant positive correlation with the amount of change perceived by the apparel manufacturer. Based on this analysis, the null hypothesis of no correlation of Quick Response procedures on the amount of change was rejected.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate the incorporation of Quick Response into the textile/apparel/retail complex. The conceptual model for this study was developed from the marketing theories of Levitt (1960), Kotler (1984), and Cravens and Lamb (1986). These marketing theories emphasize the importance of understanding the customer and preparing a fit between the customer and the organization. The tools of an analytical marketing system, as described by Kotler (1984), were used to understand the customers of Quick Response and to explore the morphology between the Quick Response product and the customer.

The definition for the Quick Response strategy was studied with face-to-face interviews and with a mailed questionnaire. The demographic features of the apparel industry were documented with interviews and a questionnaire. The influence of certain demographic or operational features on Quick Response activity adoption was studied. This study also reviewed the potential correlation between adoption of Quick Response techniques and changes in

the customer services and products for apparel manufacturers.

The concept of Quick Response has emerged from an environment of change for the apparel manufacturer. Apparel from over 100 different countries have continued to enter the U.S. retail stores with resulting loss of market share for the U.S. apparel manufacturers (ATMI, 1985). Consumer demands for more and different goods have increased (Barner, Berkstresser, Michel, and Williamson, 1985). Industry leaders have questioned the traditional business practices of the apparel industry (F. Fortess, personal communication, 1987).

Quick Response is offered as a solution to the eroding market share and reduced productivity of the apparel industry, but Quick Response requires communication between trading partners (AAMA, 1987b). The level of communication required is higher and more interdependent than has ever existed in the textile/apparel/retail complex. To effectively use the tool of Quick Response, a supplier must have knowledge of the customer and must be skilled in ways to rapidly respond to the needs of that customer.

A random sample of 203 apparel manufacturers was selected from a list of the 700 manufacturers operating in North Carolina under Standard Industrial Classification (SIC) code 23. The inclusive list of manufacturers was obtained from the North Carolina Department of Commerce.

The sample was stratified by size according to the number of employees and by target consumer with the categories of men, women, and children. The sample was surveyed with a mailed questionnaire for data collection. The rate of return was 47.5% for usable questionnaires. All size levels and target consumer groups from the population were represented by the responding apparel manufacturers, and the number of respondents per category were in proportion to the group distributions in the sample.

Profiles of the respondents. Knowing your customer is an important part of the marketing strategy of Quick Response (Barner, Berkstresser, Michel, and Williamson, 1985). The responses to the demographic questions from the survey provide a profile of the North Carolina apparel manufacturers. All sizes of apparel manufacturing operations were represented among the respondents. A direct correlation was found between the number of employees and the annual sales volume for a company. The most common sizes in the respondent pool were: 20-49 employees and less than $1M, 100-249 and $10-19.9M, 250-499 and $20-50M, and over 500 employees with over $50M. Four major categories of target consumers were represented: men and boys; women and girls; children and infants; and multiple types (men, women, and/or children).

The retail customers of these apparel manufacturers were a diffusion of types. For the majority of respondents,

the retail customer was a large corporate chain with a mixed product line, both of depth and breadth. The responses for type of chain were divided between department stores and mass merchandisers.

About one fourth of the respondents indicated that they did not have direct access to their retail customers. As subcontractors they had other manufacturers or jobbers as customers. The product manufactured by the majority of the respondents was a basic product both in fashion styling and in length of selling season. The end use categories chosen by over 50% of the respondents were apparel items which were categorized differently from the traditional listings of the SIC codes from 2311 to 2385.

A definition for Quick Response. The definition for Quick Response was investigated through the interviews and the questionnaire. Of the 17 Quick Response activities listed in Section I of the questionnaire, the items which were judged to have the most usage were reduction of wait time for inventory, the elimination of redundant testing, and short cycle production. All three of these activities have short term returns with limited capital investment. The largest investment needed to use these three techniques involves a change in management orientation and increases in partnership with supplier.

No respondent indicated a 100% activity rate for all activities; however, all 17 activities had at least 15% of

the respondents to indicate usage. Only four respondents indicated no activity for any of the Quick Response techniques.

A summation variable was formed by adding the responses to the Quick Response items in the questionnaire. This variable was labeled a Quick Response Quotient. A histogram of the Quick Response Quotient revealed that the spread and variation was not a bimodal distribution of users and nonusers but a continuum of different users. Quick Response was not a homogeneous variable, but a heterogeneous concept. This supported the advice of Kurt Salmon Associates (1987) which recommends that different strategies are appropriate for different types of manufacturers.

To investigate the theory that Quick Response is not just one concept but is a multifaceted strategy, the Quick Response items from the questionnaire were analyzed for principle components. Principle components were extracted from the response items in the questionnaire. Factor analysis with PROC FACTOR and reliability tests revealed five factors. Of the 17 Quick Response activities, 14 items were retained in the factors, because each item had a high loading (.55 or above) on only one factor. In addition Factors 1, 2, and 3 had high reliability scores). Based on the small number of items in Factor 4 and 5, Factor 4 had a low reliability, and Factor 5 could not be tested. The conclusions involving Factors 4 and 5 are considered

tentative until further reliability testing can be performed.

All five factors were retained because of their identification in industry concerns and their individual contributions to the Quick Response morphology. Factor scores were determined for each factor. The five factors were analyzed as the refined dependent variables and were used in all further analyses. The five Quick Response factors were identified as follows: (1) Inventory Control, (2) Information Sharing, (3) Bar Coding, (4) Product Planning, and (5) Shade Sorting.

The Quick Response factors were further validated by analysis with the direct questions about Quick Response and Just-In-Time (JIT). Four of the five factors were significant with either Quick Response or JIT, and Factor 2, Information Sharing, approached significance with JIT.

A yes on the Quick Response answers corresponds with high scores on Product Planning factor. Product Planning is essential for flexibility and responsiveness to the consumer. The responses for Shade Sorting were reversed. This result was a surprise because shade sorting of fabric rolls was one of the first items addressed by the Textile Apparel Linkage Council (TALC). Also unexpected was the result that Shade Sorting was not significantly associated with JIT, because automation of testing and procedures is basic to the JIT operation.

Information Sharing, described by McClean (1986) as necessary to achieve the benefits of Quick Response, was not significantly associated with the Quick Response question and only approached significance with JIT. This lack of use parallels the industry's traditional methods of secrecy. The use of Electronic Data Interchange (EDI) requires computer expertise which was found to be limited by Kosh (1988).

Inventory Control, the essence of JIT, related positively with the JIT question. JIT operations have the goods arrive just in time to be used in production and eliminate duplication and wait time. Bar Coding, another technique for the quick handling of inventory, varied with positive responses to the JIT question. Product Planning and Information Sharing, the additional significant factors, are deemed necessary by Haber (1988) to effectively meet the needs of the customer.

Testing of the hypotheses about moderating factors. Four hypotheses were developed which examined the relationship between demographic features of apparel manufacturing operations and the level of Quick Response which was used by that operation. The four characteristics --target consumer, size, seasonality, and retail customer-- were tested for their portion of the variance found with the different levels of the five Quick Response factors.

General Linear Model (PROC GLM) with Analysis of

Variance (ANOVA) was used to explore the relationship of the demographic features to the five Quick Response factors. The variables of target consumer, size, and the leadership position with the retail customer showed statistically significant relationships with the factors of Inventory Control, Bar Coding, Product Planning, and Shade Sorting. The five factors did not differ significantly with the type or size/ownership of the retail customer and did not differ significantly with the seasonality of the goods. Only one demographic variable, size by annual sales volume, approached significant variance with the Information Sharing factor. For further examination of the relationship between factors and demographic features, paired comparisons were made and tested.

Target consumer was significant with the factors of Product Planning and Shade Sorting. Results indicated that the type of consumer for which a company targeted its product was associated with that company's choice of Quick Response techniques. The null hypothesis (1a) was rejected. Contrast statements were used to provide a comparison between target customer types. The contrasts were made between men's wear manufacturers and other categories of target consumer manufacturers. The following differences were found:

1. Men's wear manufacturers used more inventory control techniques than women's wear manufacturers.

2. Children's wear manufacturers used more shade sorting information than manufacturers for any other target group.

Hypothesis 1b was used to examine the characteristic of size, both by number of employees and with annual sales volume. Using PROC GLM the categories of size were compared to the variation in usage of Quick Response for apparel manufacturers. Significant differences were found with the factors of Inventory Control and Shade Sorting. Differences among the size groups with the Information Sharing factor approached significance. Comparison testing was completed for the contrasts between large and small manufacturers. The following differences were found:

1. Large manufacturers used more inventory control techniques than the medium size and small manufacturers.

2. Shade sorting information was used more often by the large manufacturers.

3. The group of the smallest manufacturers had a level of standard deviation larger than all other size groups. Their usage of Bar Coding, Product Planning, and Inventory Control techniques appeared to be at higher levels than all size groups except the largest manufacturers.

4. Very large manufacturers and very small manufacturers indicated higher usages of Electronic Data Interchange (EDI) and other computerized linkages with suppliers.

The influence of the seasonality of the product on the level of Quick Response used by apparel manufacturers was investigated in Hypothesis 1c. If significant differences had been found, paired comparisons would have been made between manufacturers of basic goods and manufacturers of highly seasonal goods. The information from PROC GLM showed diversity within the respondents but not between groups. Hypothesis 1c was not rejected, however; several patterns were noted:

1. The highly seasonal group had higher variation in their choice of Quick Response techniques than all other seasonal groups.

2. Basic goods had more usage of Information Sharing techniques than all other seasonal groups.

The retail customer for these apparel manufacturers was described as to type of business, size/ownership of the business, and marketing leadership between manufacturer and retailer. These features of the retail customer were investigated for their link with the Quick Response techniques used by the apparel manufacturer (Hypothesis 1d). When grouped by the categories of retail customer type or by the size/ownership of the retail customers, the Quick Response factors used by the respondents did not vary significantly.

The third aspect of the retail customer profile did show significant relationships with some of the Quick

Response factors. The apparel manufacturer and the retailer represent steps in a marketing channel, and the determination of who is the channel captain can affect marketing decisions. The relationship with the retailer was significant with the factors, Bar Coding and Inventory Control.

Paired comparisons were tested to locate the significant differences. The findings of these tests signify a rejection of the null hypothesis. The results indicated that features of the retailer may have a relationship to the level of Quick Response selected by an apparel manufacturer. Hypothesis 1d was rejected. The following differences were found:

1. When product and marketing changes are to be made, apparel manufacturers who lead their retail customers use higher levels of inventory control procedures.

2. Bar coding is used most by the one respondent that chose to ignore the changes suggested by retail customers. The next highest usage of bar coding was from the apparel manufacturers who were leaders of change.

3. Manufacturers appear to be choosing their Quick Response techniques independent of influences from retailers or as leaders in the soft goods marketing channel.

Testing of the hypothesis about Quick Response and change. As the usage of Quick Response techniques increase in the apparel industry, the potential for change in the

product and in the linkage to customers increases. Hypothesis 2 was used to test the strength of the correlation between the variables of Quick Response and amount of change. Vetack (1987) has stated that the entire textile/apparel/ retail complex is in a state of change. As production and distribution changes are enacted to meet the marketing challenges of the 1980s, he discerns that other changes will become evident and widespread in the industry.

For this study, the variable of change was measured by the apparel manufacturer's rating of the amount of change for a list of items pertaining to product and customer services. Of the individual items, the quality of product and the number of customer contacts were the two items showing only positive change. The number of product seasons was indicated to have the least amount of change. For testing the hypothesis, the amount of change per respondent was a summation variable. The responses for each item were squared to remove the direction of change and were totaled. The change scores ranged from 0 for eight percent of the respondents to 39, which was 75% of the potential maximum score.

The change variable, representing amount of perceived change, was tested for correlation with the distribution of usage found for each of the Quick Response factors. The procedure, PROC CORR, was used for the analysis. Three factors were found to correlate significantly with the

amount of change. All three correlations were positive in direction. Amount of change correlated with the Inventory Control factor, the Product Planning factor, and the Shade Sorting factor. The hypothesis of no correlation between Quick Response level and change of the augmented product was rejected (Hypothesis 2). Increased usage of any of these three Quick Response factors coincided with increased change in the product and customer services of a company.

This study was designed to obtain both demographic and analytical information about apparel manufacturers and their Quick Response operational procedures. The definition of Quick Response was examined, and Quick Response was found to be a heterogenous construct. This information about Quick Response was applied to establish a structured relationship between the use of Quick Response and the demographic and organizational features of apparel manufacturers. In addition, the impact of an apparel manufacturer's use of Quick Response was determined, and changes in the industry were examined.

Conclusions

Information and techniques from textile manufacturing, apparel manufacturing, retailing, and marketing were used in this study to provide an integrated approach to study Quick Response. Efficient and productive manufacturing processes are but one aspect of successful apparel manufacturing. To meet the challenges of the competitive environment, an

apparel manufacturer must practice skillful management of his total operation (F. Fortess, personal communication, 1987). To maintain and possibly regain market share, Quick Response is offered as a strategy to be used by U.S. apparel manufacturers. The financial success of Quick Response has been documented in pilot programs promoted by the Crafted with Pride in the USA Council. To better utilize the strategic marketing tool, Quick Response, improved knowledge of its adoption and impact on the apparel industry was needed.

Knowledge of the apparel manufacturer is important when establishing partnerships between supplier and customer. Results of this study indicate that all manufacturers do not use the same Quick Response techniques. The data indicated that some aspects of an apparel manufacturers organization influenced the choice of Quick Response techniques used for that company. No one combination of techniques appears to be correct for all manufacturers. The type of consumer for which the product is targeted and the size of the manufacturing operation are related to the level of Quick Response which is used.

Each manufacturer has selected techniques which fit the customer, consumer, or company. For apparel manufacturers, use of Quick Response is not driven by the retailer as is commonly believed, but in fact the reverse is often true. Apparel manufacturers who use Quick Response tend to be

leaders in their marketing partnerships. The decision for a manufacturer in the textile/apparel/retail complex is not whether the use of Quick Response is recommended but rather which techniques are most appropriate for the manufacturer and the trading partners. The tradition of individuality of the industry appears to be continuing despite efforts for standardization.

Uses of Quick Response are correlated with other changes in the industry. Products and customer services are changing with an apparel manufacturer's use of Quick Response. These changes may also be caused by additional variables, but as the industry moves to higher levels of Quick Response, all segment of the industry including consumers should be aware of the potential for changes in product and operational procedures for U.S. apparel.

Limitations of Findings

The sample size of the very small manufacturer, the manufacturer of highly seasonal and fashion goods, and the manufacturer of designer or high fashion goods was smaller than that of other groups. These groups are not present in the North Carolina apparel manufacturing population to the extent that they are in existence in the U.S population. The limited size of these groups may limit the generalizability of the results to the population they represent.

The sample was not stratified by manufacturer, jobber, or subcontractor. Government statistics do not differentiate among these groups. For the implementation of Quick Response, indications are that these groups have different characteristics and concerns from full process manufacturers.

The terms for profiling a retail operation are very diverse. Operations can be categorized by size, ownership, product line, product mix, and other variables. The questions on retail size and retail ownership may not have covered all possible definitions, and some of the categories were not mutually exclusive. A number of respondents checked the category of other or left the questions unanswered.

The factor analysis of the Quick Response item list resulted in two factors, Product Planning and Shade Sorting, containing fewer than three items per factor. These two factors have a more narrow focus than the other three factors. Fewer items relating to these factors were entered in the original Quick Response item list. This low item content lowers the reliability results for the Product Planning factor and the Shade Sorting factor.

The economic environment in which manufacturers operate is constantly fluctuating. The apparel world is besieged with cultural, economic, and other, unexplainable

influences; therefore, the existence of confounding variables must be recognized.

The sample was limited to the geographic subdivision of North Carolina. Although North Carolina is one of the most active apparel manufacturing states in the U.S. the concerns of this population may be different from other apparel manufacturers. Different economic conditions and different working environments exist in this southern state which may influence the operational procedures of a company.

Terms used by manufacturers who are familiar with Quick Response are new to the industry. Some of the terms in this study may have different interpretation to members of the industry, for example: shade sorting, EDI, POS, and JIT. Even Quick Response is not established as a clearly defined term. The answer to Quick Response question was yes (66%) to no (33%), but only four percent of the respondents had zero Quick Response usage and no respondent had a 100% usage of all Quick Response items.

This study was performed as a double blind study. This confidentiality was necessary because of the proprietary nature of the questions and the traditional operating procedures of the industry. This feature restricted the accuracy of the follow up and prohibited the confirmation of questions which were incomplete or had conflicting responses.

Implications

Since 1973, the U.S. apparel industry has lost market share in its sales to U.S. consumers. The sales have been taken by imported apparel which sells at lower prices and with more variety. The fiber/textile/apparel/retail complex has sought solutions and examined ways to increase the competitive position of the industry.

Quick Response has been proposed as a solution to the marketing problems which plague the industry. Several successful pilot studies have been completed. These studies illustrated the reduction in turn time, the reduction in inventory, and the increase in responsiveness to the market which can be achieved through partnership, automation, and planning. Although success is documented and interest is high, actual conversion to a responsive industry lags. Preliminary studies by Little (1987), Ernst and Whinney ("Are you doing," 1988), and Kurt Salmon Associates (Gillease, 1988b) indicate that Quick Response techniques have been adopted by only 30% of the fiber/textile/apparel/ retail industry.

To operate in this changing and competitive environment, a member of this channel must have an understanding of the potential partners and the tools used in the partnership. Knowledge of the apparel manufacturer's operation and the Quick Response techniques used is essential. Apparel manufacturers are a segmented market and

each segment has different concerns and needs. Quick Response is a multifaceted technique which can be utilized differently by different segments of the total market.

Anyone operating in this environment needs to segment the target market according to needs and characteristics which will affect the use of the product, Quick Response. A supplier needs to know how to approach the customer and deliver the maximum useful product. Differences among apparel manufacturers do exist, and these differences do relate to Quick Response usage. In addition, Quick Response usage relates to further changes in product and operations and to corresponding changes in the partnerships between channel members.

Recommendations

This study was designed to examine the relationship between the relative presence or absence of a Quick Response morphology with industry relevant variables. The preliminary tests with the ANCOVA indicated the existence of a more complex interrelationship between the Quick Response factors and the demographic variables for apparel manufacturers.

Further research and areas for expansion of research are indicated by the findings of this study. Quick Response is not a homogeneous construct. The presence of five factors instead of a summation variable reveals the need for more testing of the Quick Response concept. Further testing

of the five factors and refining of their definitions is possible.

The use of point of sale information (POS) did not appear to be related to any Quick Response factor. This technique was considered essential in the Quick Response pilot studies performed by the Crafted with Pride Council (Technical Advisory Committee of AAMA, 1987). Since the use of POS is important to the sharing of information between partners, research is needed to investigate the lack of significance of this item.

The findings of the differences in Quick Response factor scores for size of plants may suggest the presence of linear trends between Quick Response factor scores and size increments of plants. Linear regression could be used to test the relationship between size groups and the significant Quick Response factors and a line could be fitted to define the trends.

The variables investigated in the present study account for only a part of the differences among apparel manufacturers use of Quick Response factors. Other influences could be researched. Potential variables to be researched are attitude of management, fashion position of the company, and ownership of the business.

Braden, Holford, and Richardson (1987) indicate that the retailer is the operative shaping the industry's use of Quick Response. Findings from the present study are not

supportive of this premise. Improved identification of the retailer and other customers of apparel manufacturers is needed, and further research could expand these categories.

The subcontractor appeared as an important segment in the study. Identification of the size and characteristics of this group is needed. Exploration pertaining to their concerns and their competitive position could be performed.

The group of highly seasonal goods has a strong indication of existence from Spevack (1987, October 28), but this group did not appear in the demographics collected by the present study. The existence of this new group is yet to be verified.

Men's wear because of its standardization of style and slower fashion turn is perceived to be ideal for Quick Response (Technical Advisory Committee of AAMA, 1987). Manufacturers for this target group should be advanced in their usage of Quick Response, but strong relationships were not found for each Quick Response factor. Further testing of the categories of target consumer is needed.

The SIC codes were not used by the majority of apparel manufacturers. Additional research is needed to match current industry terms with traditional apparel categories. The redefinition of existing SIC codes and the addition of new codes should be investigated.

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APPENDIX A

QUESTIONNAIRE FOR APPAREL MANUFACTURERS

QUESTIONNAIRE FOR APPAREL MANUFACTURERS

I. OPERATIONAL PROCEDURES:

-Consider each of the listed procedures and decide at what level you are using each of these.

-Please CIRCLE the percentage which best describes the level of your use for each procedure.

	Percentage				
Planning					
1. Garment design is done by CAD	0	25	50	75	100
2. Reduction in inventory size	0	25	50	75	100
3. Small lot fabric orders	0	25	50	75	100
4. Receive retail POS information	0	25	50	75	100
5. EDI-confirmation orders/suppliers	0	25	50	75	100
6. Use of shade sorting of rolls	0	25	50	75	100
Production					
1. Reduction of wait time -inventory	0	25	50	75	100
2. Elimination of redundant testing	0	25	50	75	100
3. Short cycle production	0	25	50	75	100
4. Automated sewing operations	0	25	50	75	100
5. Scan bar coding of fabric rolls	0	25	50	75	100
6. Overhead conveyor-material handle	0	25	50	75	100
Distribution					
1. Bar coding of finished garments	0	25	50	75	100
2. Share product information/customer	0	25	50	75	100
3. EDI-confirmation - orders/customer	0	25	50	75	100
4. Garment dyed products	0	25	50	75	100
5. Customer involved in product plan	0	25	50	75	100

II. CHANGES IN PRODUCT/CUSTOMER SERVICES:

-Consider the following questions in relation to how each factor has changed for your company over the last THREE (3) years.

-CIRCLE the letter which best describes the CHANGE for each item for your company.

PRODUCT

	decrease greatly	decrease slightly	same	increase slightly	increase greatly
1. Stock Keeping Units	-2	-1	0	1	2
2. Product seasons	-2	-1	0	1	2
3. Items/product line	-2	-1	0	1	2
4. Styling features	-2	-1	0	1	2
5. Quality of product	-2	-1	0	1	2
6. Brand recognition	-2	-1	0	1	2
7. Wholesale price	-2	-1	0	1	2

CUSTOMER SERVICES

	decrease greatly	decrease slightly	same	increase slightly	increase greatly
1. Customer specs.	-2	-1	0	1	2
2. Customer reorders	-2	-1	0	1	2
3. Retail customers	-2	-1	0	1	2
4. Customer contacts	-2	-1	0	1	2
5. Target markets	-2	-1	0	1	2
6. Customer shipments	-2	-1	0	1	2

III. COMPANY CHARACTERISTICS:

-CIRCLE the response which describes your product/company
-Circle ONE best answer per question.

1. How many hourly employees do you have?
   a. fewer than 20
   b. 20 - 49
   c. 50 - 99
   d. 100 - 500
   e. over 500

2. Who are the majority of your retail customers?
   a. department stores
   b. limited line stores
   c. mass merchandisers
   d. other (specify)_____

3. What is the size of your average retail customer?
   a. large corporate chain
   b. moderate size private chain
   c. large single stores
   d. small boutiques
   e. merchandising conglomerate

4. What describes the products of your retail customers?
   a. narrow and deep b. wide and shallow
   c. a mixture of a and b d. none of the above

5. Which category best describes your garments?
   a. women's wear
   b. men's wear
   c. children's, infants' wear
   d. women's and mens' wear
   e. women's, mens', & children's
   f. men's & children's
   g. women's & children's

6. Which category of seasons describes your product lines?
   a. "highly seasonal"- less than 10 week product life
   b. "fashion products"- 10 week product life
   c. "seasonal products"- 20 week product life
   d. "basic products" - sold throughout the year

7. What are the price points for majority of your garments?
   a. budget
   b. moderate
   c. better
   d. designer

8. What is the fashion position of your garments?
   a. high fashion b. mass fashion c. basic styling

9. Which classification of end-use describes your garments?
   a. suits, coats
   b. shirts, nightwear
   c. work clothing
   d. separates
   e. blouses, waists
   f. dresses
   g. skirts
   h. outerwear-not listed above
   i. all other (specify)_____

10. What is your annual gross sales figure in dollars?
   a. less than 1 million
   b. 1 million - 1.9 million
   c. 2 million - 4.9 million
   d. 5 million - 10 million
   e. over 10 million

11. Who is responsible for production planning?
   a. centralized administration
   b. production supervisor
   c. sales department
   d. other (specify)_____

12. Where is the marketing function located in the company?
   a. a separate department b. as part of sales
   c. a subunit of production d. other (specify)

13. When making choices about future capital investments what ROI do you expect?
   a. short term profitability
   b. short term loss but long term profit
   c. ROI is not a factor

14. What do you examine to judge productivity of company?
   a. Total Productivity
   b. direct labor productivity
   c. single input-output relationships
   d. other (specify)_____

15. When making a change in a business practice which item describes your relationship with your retail customers?
   a. you lead your customers
   b. you follow the lead of your customers
   c. you ignore most changes
   d. other (specify)_____

16. Do you use Quick Response strategies in operations?
   a. yes b. no

17. Do you use J-I-T techniques in your plant?
   a. yes b. no

APPENDIX B

ITEMS FOR THE MAILING OF THE QUESTIONNAIRE

Prenotification Letter

Date

Plant Manager
Company
Street Address
City, State Zip Code

SALUTATION:

As you know, American apparel manufacturing has experienced many changes over the past ten years. While the American textile industry in general has been the subject of many studies, there has been no published comprehensive research about the North Carolina apparel industry. Apparel manufacturers face unique problems. As part of my dissertation research, I am documenting those concerns and investigating implications for the future.

As a key decision-maker in your apparel operation, you will be receiving a survey from the North Carolina State University School of Textiles and the University of North Carolina at Greensboro within the next seven to ten days. Industry leaders who have previewed the survey feel that the results will generate significant insight into present and future issues specific to the NC apparel industry.

Because you participate, you and your firm will share in the results by receiving an executive summary of the findings. We can assure you that the study is carefully designed so that individual firms cannot be identified. The survey can be completed in approximately 10 minutes.

Dr. G. Berkstresser from NCSU and Dr. Nicholas Williamson from UNCG--both consultants for the recently published textile industry study from the US Office of Technology Assessment--are working with me on this study. If you have questions or concerns in advance of receiving the survey, please feel free to contact Dr. Williamson at (phone number) Dr. Berkstresser at (phone number) or me at (phone number).

Sincerely,

Doris H. Kincade
Ph.D Candidate
Dept of Clothing/Textiles
UNC-Greensboro

Cover Letter for the Questionnaire

Date

Plant Manager
Company
Street Address
City, State Zip Code

SALUTATION:

Recently the American textile industry has been the subject of many articles and studies. Most of these analyze the industry in general but do not specialize on the North Carolina apparel manufacturers. As part of my dissertation research, I want to document your concerns. You and your plant will share in the results by receiving an executive summary of the study. Dr. Gordon Berkstresser from NCSU and Dr. Nicholas Williamson from UNCG--both consultants for the recently published textile industry study from the US Office of Technology Assessment--are working with me.

The enclosed survey asks about your plant and your relationships with your customers and suppliers. It can be completed in less than 10 minutes. A few of the questions ask about your plant's size and financial position. (No useful analysis can be made without some indication of your plant's activity and product position.) We know that this information must remain confidential so we are not asking for exact figures.

The study is carefully designed so that individual firms cannot be identified. There are no identification numbers or invisible ink. Although I have become employed on a part-time basis by Cone Mills since the research began, I will not know who has returned the survey or the postcard because they are to be returned directly to Dr. Berkstresser at NCSU. The return postcard ensures that your name will be removed from a follow-up list. Return only the survey to Dr. Berkstresser in the postage free envelope.

I realize your time is at a premium, but the success of this important study will depend on your response. Please return the completed survey by May 5, 1988. If you wish to receive an executive summary of the study, please indicate this on the postcard. The results will be mailed to you within the next few months. If you have any questions, please contact Dr. Berkstresser at (phone number). Thank you very much.

Sincerely,

Courtesy Postcard

Back of Card

____PLEASE SEND A COPY OF THE NC APPAREL INDUSTRY STUDY RESULTS TO:

Plant Manager
Company
Street Address
City, State Zip Code

____REMOVE MY NAME FROM THE FOLLOW-UP LIST

Front of Card

Textile Management & Technology
Box 8301
College of Textiles
North Carolina State University
Raleigh, NC 27695-8301

ATTN: Dr. G. Berkstresser

Thank-you Post Card

Date

Over a week ago you received a questionnaire from NCSU and UNCG asking about your apparel operation. The responses will be used to profile the NC apparel industry and to examine its future competitive position.

If you have already returned the completed questionnaire, please accept our sincere thanks. If not, please take 10 minutes and complete it today. For the study to be representative of NC, it is extremely important that your firm be included. If you have not received it, please call me immediately to have one sent to you.

Doris H. Kincade
phone number

Cover Letter For Second Mailing

Date

Plant Manager
Company
Street Address
City, State Zip Code

SALUTATION:

About three weeks ago, I wrote to you seeking information about your apparel manufacturing operations. As of today we have not yet received your completed questionnaire. We feel that failure to participate in this important study will deprive your firm of valuable information about the apparel industry.

I am writing to you again because a response from each plant is critical to developing a comprehensive and accurate profile of the North Carolina apparel industry. Indications are that the NC apparel industry has characteristics which make it different from other segments of the textile industry. As such, there are implications for the industry's competitive position in the future.

The responses to the questionnaire will be tabulated to protect the identity of individual firms. All responses are to be returned to Dr. Gordon Berkstresser at NCSU. The questionnaires contain no identification numbers. Complete confidentiality is assured.

In case your questionnaire has been misplaced, I have enclosed a replacement for your convenience. Please take approximately 10 minutes and complete it immediately. also, return the separate courtesy post card so your name can be removed from the nonrespondents' list.

Thank you very much for your time and consideration.

Sincerely,

Doris H. Kincade
Ph.D Candidate
Dept Clothing/Textiles
UNC-Greensboro

Forms Used for Follow-up Phone Calls

General Introduction

Hello, my name is _____

I am calling from the University of North Carolina at Greensboro.

Over the past several months 2 copies of a survey were sent to your company.

As of today we have not received a response from your company.

(Give further explanation if needed
-- Survey asks about your production practices and your customer contacts.
-- Survey was sent out by North Carolina State University to North Carolina apparel manufacturers
-- Survey was addressed to Plant Manager)

May I speak to the plant manager or someone else about this survey?

Form for Each Company

Company Name
Street Address
City, NC Zip Code

CALLED Yes No
PHONE Number PHONE Yes No

****

1. **IF YES -- YOU GET TO SPEAK TO SOMEONE**

Hello, my name is _____
I am calling from the University of NC at Greensboro.
Over the past several months 2 copies of a survey were sent to your company.
As of today we have not received your response.

Have you received this survey?

A. (IF HAVE RECEIVED)

Will you return the survey today?

(IF NO, try to determine why not)

What questions do you have?

Your responses will be confidential.

B. (IF HAVE NOT RECEIVED)

Would you answer the questions if a copy is sent?

Name---
Correct Address----

Thank-you for your time.

****

2. **IF NO -- NOT GET TO SPEAK TO SOMEONE**

Could you give me some information about the company?

A. (IF YES) (Ask the questions on page 3 of the survey, THEN the first two pages)

B. (IF NO) Thank-you very much

Second Form to Verify Results of Phone Calls

Name
Company Name
Street Address
City, NC Zip Code
phone number

Did you call this company? Yes No

Did someone answer? Yes Busy No answer Disconnected
Wrong no.

Had they received the survey? Yes No

If yes, had they returned the survey? Yes No

Why not?_____

If no, did they request another survey? Yes No

If they are to get another survey give:

name:

address:

Additional comments:

APPENDIX C

FREQUENCIES FOR DEMOGRAPHIC QUESTIONS

FREQUENCIES FOR SECTION III QUESTIONS

SIZE #	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
a	5	7.6	5	7.6
b	11	16.7	16	24.2
c	12	18.2	28	42.4
d	13	19.7	41	62.1
e	15	22.7	56	84.8
f	10	15.2	66	100.0

RETAIL TYPE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	5	.	.	.
a	18	29.5	18	29.5
b	8	13.1	26	42.6
c	19	31.1	45	73.8
d	16	26.2	61	100.0

RETAIL SIZE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	10	.	.	.
a	33	58.9	33	58.9
b	8	14.3	41	73.2
c	6	10.7	47	83.9
d	6	10.7	53	94.6
e	3	5.4	56	100.0

RETAIL PRODUCT	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	9	.	.	.
a	9	15.8	9	15.8
b	13	22.8	22	38.6
c	28	49.1	50	87.7
d	7	12.3	57	100.0

TARGET CONSUMER	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
a	12	18.2	12	18.2
b	8	12.1	20	30.3
c	16	24.2	36	54.5
d	10	15.2	46	69.7
e	8	12.1	54	81.8
f	4	6.1	58	87.9
g	8	12.1	66	100.0

SEASON	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	1	.	.	.
a	3	4.6	3	4.6
b	9	13.8	12	18.5
c	20	30.8	32	49.2
d	33	50.8	65	100.0

PRICE POINTS	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	1	.	.	.
a	10	15.4	10	15.4
b	39	60.0	49	75.4
c	14	21.5	63	96.9
d	2	3.1	65	100.0

FASHION POSITION	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
a	5	7.6	5	7.6
b	26	39.4	31	47.0
c	35	53.0	66	100.0

SIC CODES	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	1	.	.	.
b	16	24.6	16	24.6
c	2	3.1	18	27.7
d	3	4.6	21	32.3
e	3	4.6	24	36.9
f	3	4.6	27	41.5
g	1	1.5	28	43.1
h	7	10.8	35	53.8
i	30	46.2	65	100.0

SIZE $	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	2	.	.	.
a	9	14.1	9	14.1
b	5	7.8	14	21.9
c	9	14.1	23	35.9
d	9	14.1	32	50.0
e	10	15.6	42	65.6
f	10	15.6	52	81.3
g	12	18.8	64	100.0

PRODUCTION PLAN	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	2	.	.	.
a	38	59.4	38	59.4
b	11	17.2	49	76.6
c	3	4.7	52	81.3
d	12	18.8	64	100.0

MARKETING	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	3	.	.	.
a	16	25.4	16	25.4
b	41	65.1	57	90.5
c	1	1.6	58	92.1
d	5	7.9	63	100.0

ROI	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	5	.	.	.
a	24	39.3	24	39.3
b	31	50.8	55	90.2
c	6	9.8	61	100.0

PRODUCT RATE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	2	.	.	.
a	24	37.5	24	37.5
b	32	50.0	56	87.5
c	3	4.7	59	92.2
d	5	7.8	64	100.0

RETAIL RELATION	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	5	.	.	.
a	18	29.5	18	29.5
b	34	55.7	52	85.2
c	1	1.6	53	86.9
d	8	13.1	61	100.0

QUICK RESPONSE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	1	.	.	.
a	44	67.7	44	67.7
b	21	32.3	65	100.0

JIT	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
	4	.	.	.
a	19	30.6	19	30.6
b	43	69.4	62	100.0

APPENDIX D

STATISTICAL TABLES

Table D-1

Analysis of Variance of Quick Response Factors for the Quick Response Question

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Quick R	1	941.57	941.57	1.48
Error	63	40194.59	638.01	Pr > F
Total	64	41136.15		0.229

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	44	44.09	23.80	0	90
No	21	35.95	28.13	0	100

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Quick R	1	36.63	36.63	0.05
Error	63	42758.24	678.70	Pr > F
Total	64	42798.87		0.817

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	44	25.18	26.59	0	100
No	21	26.98	24.85	0	75

Table D-1 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Quick R	1	301.92	301.92	0.58
Error	63	32854.06	521.49	Pr > F
Total	64	33155.98		0.4496

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	44	15.72	24.72	0	100
No	21	11.11	18.13	0	67

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Quick R	1	2293.85	2293.85	4.23
Error	63	34134.03	541.81	Pr > F
Total	64	36427.88		0.044

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	44	26.99	25.71	0	100
No	21	14.28	16.90	0	50

Table D-1 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Quick R	1	4051.95	4051.95	3.26
Error	63	78198.05	1241.24	Pr > F
Total	64	82250.00		0.076

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	44	29.55	30.15	0	100
No	21	46.43	44.22	0	100

Table D-2

Analysis of Variance of Quick Response Factors for Just-in-Time Question

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
JIT	1	3099.48	3099.48	5.15
Error	60	36134.39	602.24	Pr > F
Total	61	39233.87		0.027

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	19	52.89	23.76	15	90
No	43	37.59	24.87	0	100

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
JIT	1	1511.48	1511.48	2.30
Error	60	39348.74	655.81	Pr > F
Total	61	40860.22		0.134

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	19	33.77	28.95	0	100
No	43	23.06	24.05	0	92

Table D-2 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
JIT	1	2104.58	2104.58	4.15
Error	60	30414.46	506.91	Pr > F
Total	61	32519.04		0.047

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	19	23.68	32.07	0	100
No	43	11.05	16.84	0	67

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
JIT	1	3485.56	3485.56	6.50
Error	60	32172.20	536.20	Pr > F
Total	61	35657.76		0.013

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	19	34.87	28.44	0	100
No	43	18.60	20.48	0	75

Table D-2 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
JIT	1	315.87	315.87	0.24
Error	60	79280.91	1321.35	Pr > F
Total	61	79596.77		0.627

Level	n	Mean	Std Dev	Minimum	Maximum
Yes	19	32.89	27.70	0	100
No	43	37.79	39.48	0	100

Table D-3

Analysis of Variance of Quick Response Factors for the 4 Types of Target Consumers

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Target C	3	809.06	809.06	0.40
Error	62	42020.10	677.74	Pr > F
Total	65	42829.17		0.755

Level	n	Mean	Std Dev	Minimum	Maximum
Men	12	47.91	21.58	20	90
Women	20	37.75	28.99	0	100
Child	16	40.31	27.41	0	85
M,W,C	18	40.00	23.83	0	85

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Target C	3	1206.26	402.09	0.54
Error	62	42249.13	681.44	Pr > F
Total	65	43455.39		0.624

Level	n	Mean	Std Dev	Minimum	Maximum
Men	12	29.17	24.23	0	67
Women	20	20.41	26.56	0	92
Child	16	23.44	27.59	0	100
M,W,C	18	30.56	25.40	0	83

Table D-3 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Target C	3	1762.07	587.36	1.15
Error	62	31593.36	509.57	Pr > F
Total	65	33355.43		0.335

Level	n	Mean	Std Dev	Minimum	Maximum
Men	12	18.75	20.45	0	58
Women	20	6.25	12.93	0	42
Child	16	16.67	29.66	0	100
M,W,C	18	17.13	24.99	0	83

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Target C	3	3770.04	1256.68	2.35
Error	62	33173.61	535.06	Pr > F
Total	61	36943.66		0.081

Level	n	Mean	Std Dev	Minimum	Maximum
Men	12	34.38	22.06	0	75
Women	20	15.00	20.92	0	75
Child	16	17.19	19.83	0	75
M,W,C	18	27.78	28.29	0	100

Table D-3 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Target C	3	9109.77	3036.59	2.44
Error	62	77301.22	1246.79	Pr > F
Total	65	86410.98		0.073

Level	n	Mean	Std Dev	Minimum	Maximum
Men	12	33.34	32.66	0	100
Women	20	35.00	38.39	0	100
Child	16	54.69	38.96	0	100
M,W,C	18	22.22	29.57	0	100

Table D-4

Analysis of Variance of Quick Response Factors by the Size/Number of Employees

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Size	5	6585.59	1317.12	2.18
Error	60	36243.57	604.06	Pr > F
Total	65	42829.17		0.068

Level	n	Mean	Std Dev	Minimum	Maximum
< 20	5	49.00	34.35	15	90
20- 49	11	24.09	30.32	0	85
50- 99	12	31.25	26.04	0	65
100-249	13	44.16	18.76	20	90
250-499	15	47.33	18.59	20	85
500+	10	52.00	25.41	15	100

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Size	5	1621.71	324.34	0.47
Error	60	41853.67	697.23	Pr > F
Total	65	43455.39		0.800

Level	n	Mean	Std Dev	Minimum	Maximum
< 20	5	28.33	39.79	0	83
20- 49	11	18.94	30.07	0	100
50- 99	12	19.44	23.39	0	66
100-249	13	25.64	22.17	0	75
250-499	15	30.55	29.99	0	92
500+	10	30.83	14.72	8	58

Table D-4 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Size	5	1600.27	320.05	0.60
Error	60	31755.16	529.25	Pr > F
Total	65	33355.42		0.697

Level	n	Mean	Std Dev	Minimum	Maximum
< 20	5	10.00	14.91	0	33
20- 49	11	16.67	33.95	0	100
50- 99	12	9.72	20.67	0	67
100-249	13	10.26	16.37	0	50
250-499	15	13.33	20.12	0	58
500+	10	24.17	25.29	0	83

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Size	5	1269.165	253.83	0.43
Error	60	35674.49	594.57	Pr > F
Total	65	36943.66		0.828

Level	n	Mean	Std Dev	Minimum	Maximum
< 20	5	27.50	43.66	0	100
20- 49	11	13.64	23.35	0	75
50- 99	12	27.08	24.91	0	75
100-249	13	22.11	17.79	0	50
250-499	15	23.33	21.06	0	75
500+	10	23.75	25.31	0	75

Table D-4 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Size	5	14181.75	2836.35	2.36
Error	60	72229.24	1203.82	Pr > F
Total	65	86410.98		0.051

Level	n	Mean	Std Dev	Minimum	Maximum
< 20	5	0.00	0.00	0	0
20- 49	11	22.73	28.40	0	75
50- 99	12	39.58	41.91	0	100
100-249	13	44.23	32.52	0	100
250-499	15	33.33	33.63	0	100
500+	10	57.50	42.57	0	100

Table D-5

Analysis of Variance of Quick Response Factors for Size/Annual Sales Amounts

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Size	6	7442.12	1208.19	2.14
Error	57	32141.11	563.88	Pr > F
Total	63	39390.23		0.062

Level	n	Mean	Std Dev	Minimum	Maximum
< $1M	9	19.44	26.51	0	80
1- 1.9	5	33.00	38.99	0	90
2- 4.9	9	45.00	28.98	10	85
5- 9.9	9	44.44	16.09	20	60
10-19.9	10	41.00	19.83	25	90
20-50	10	52.00	16.69	35	80
50+	12	51.67	26.49	15	100

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Size	6	6129.15	1021.52	1.62
Error	57	35984.57	631.31	Pr > F
Total	63	42113.72		0.158

Level	n	Mean	Std Dev	Minimum	Maximum
< $1M	9	21.29	30.55	0	83
1- 1.9	5	6.67	14.90	0	33
2- 4.9	9	22.22	33.33	0	100
5- 9.9	9	34.41	27.15	0	75
10-19.9	10	44.17	23.59	17	91
20-50	10	20.83	22.65	0	67
50+	12	26.39	16.98	0	58

Table D-5 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Size	6	3345.75	557.63	1.07
Error	57	29604.55	519.38	Pr > F
Total	63	32950.30		0.389

Level	n	Mean	Std Dev	Minimum	Maximum
< $1M	9	6.48	11.62	0	33
1- 1.9	5	0.00	0.00	0	0
2- 4.9	9	16.67	32.54	0	100
5- 9.9	9	11.11	23.57	0	67
10-19.9	10	22.50	19.66	0	50
20-50	10	11.67	20.86	0	58
50+	12	22.92	27.32	0	83

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Size	6	2885.58	450.93	0.83
Error	57	33010.41	579.13	Pr > F
Total	63	35895.99		0.551

Level	n	Mean	Std Dev	Minimum	Maximum
< $1M	9	13.89	33.33	0	100
1- 1.9	5	27.50	25.62	0	50
2- 4.9	9	34.72	22.34	0	75
5- 9.9	9	15.28	12.15	0	38
10-19.9	10	26.25	18.81	0	50
20-50	10	26.25	27.92	0	75
50+	12	20.83	24.03	0	75

Table D-5 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Size	6	14318.36	2386.39	2.04
Error	57	66687.55	1169.96	Pr > F
Total	63	81005.86		0.075

Level	n	Mean	Std Dev	Minimum	Maximum
< $1M	9	5.56	11.02	0	25
1- 1.9	5	20.00	44.72	0	100
2- 4.9	9	38.89	25.34	0	75
5- 9.9	9	44.44	42.89	0	100
10-19.9	10	35.00	29.34	0	75
20-50	10	37.50	29.46	0	75
50+	12	54.17	45.02	0	100

Table D-6

Quick Response Factor 2 Means Sorted by the Seasonality of Product

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Season	3	861.02	287.01	0.42
Error	61	41290.52	676.89	Pr > F
Total	64	42151.54		0.737

Level	n	Mean	Std Dev	Minimum	Maximum
Highly	3	30.00	5.00	25	35
Fashion	9	36.11	33.43	0	100
Season	20	40.75	25.04	0	80
Basic	33	43.94	25.24	0	90

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Season	3	3145.60	1048.53	1.61
Error	61	39649.27	649.99	Pr > F
Total	64	42794.87		0.190

Level	n	Mean	Std Dev	Minimum	Maximum
Highly	3	11.11	9.62	0	17
Fashion	9	12.96	20.03	0	50
Season	20	25.00	26.62	0	67
Basic	33	31.31	28.74	0	100

Table D-6 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Season	3	1827.42	609.16	1.18
Error	61	31520.79	516.73	Pr > F
Total	64	33348.29		0.325

Level	n	Mean	Std Dev	Minimum	Maximum
Highly	3	19.44	26.79	0	50
Fashion	9	1.85	5.56	0	17
Season	20	12.92	22.04	0	67
Basic	33	17.42	25.38	0	100

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Season	3	2865.38	955.13	1.74
Error	61	33562.50	550.20	Pr > F
Total	64	36427.88		0.169

Level	n	Mean	Std Dev	Minimum	Maximum
Highly	3	20.83	26.02	0	50
Fashion	9	12.50	25.00	0	75
Season	20	17.50	19.19	0	75
Basic	33	29.17	25.13	0	100

Table D-6 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Season	3	1031.76	343.92	0.25
Error	61	84064.39	1378.10	Pr > F
Total	64	85096.15		0.861

Level	n	Mean	Std Dev	Minimum	Maximum
Highly	3	33.33	14.43	25	50
Fashion	9	33.33	45.07	0	100
Season	20	42.50	37.26	0	100
Basic	33	34.09	35.80	0	100

Table D-7

Analysis of Variance of Quick Response Factors for Type of Retail Customer

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Type	3	2894.14	964.71	1.52
Error	57	36284.55	636.57	Pr > F
Total	60	39178.69		0.220

Level	n	Mean	Std Dev	Minimum	Maximum
Dept S	18	35.28	25.75	0	85
L Line	8	57.50	25.07	20	90
Mass M	19	45.00	15.99	25	75
Other	16	40.94	32.67	0	100

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Type	3	1040.28	346.76	0.79
Error	57	40325.57	707.43	p > F
Total	60	41363.84		0.690

Level	n	Mean	Std Dev	Minimum	Maximum
Dept S	18	28.24	30.67	0	100
L Line	8	16.67	19.92	0	50
Mass M	19	29.82	23.46	0	92
Other	16	26.04	27.87	0	83

Table D-7 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Type	3	898.82	299.61	0.63
Error	57	27040.62	474.39	Pr > F
Total	60	27939.44		0.598

Level	n	Mean	Std Dev	Minimum	Maximum
Dept S	18	15.28	27.75	0	100
L Line	8	4.17	8.91	0	25
Mass M	19	16.23	20.87	0	67
Other	16	13.02	19.24	0	67

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Type	3	376.92	125.64	0.23
Error	57	31759.35	557.18	p > F
Total	60	32136.27		0.878

Level	n	Mean	Std Dev	Minimum	Maximum
Dept S	18	20.83	27.12	0	75
L Line	8	26.56	19.41	0	50
Mass M	19	25.66	15.85	0	50
Other	16	21.09	28.40	0	100

Table D-7 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Type	3	2500.70	833.57	0.63
Error	57	75757.49	1329.08	Pr > F
Total	60	78258.19		0.600

Level	n	Mean	Std Dev	Minimum	Maximum
Dept S	18	40.28	37.51	0	100
L Line	8	31.25	39.53	0	100
Mass M	19	43.42	35.20	0	100
Other	16	28.13	35.21	0	100

Table D-8

Analysis of Variance of Quick Response Factors for Size/Ownership of Retail Customer

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Size/Own	4	1793.49	448.37	0.77
Error	51	29690.44	582.17	Pr > F
Total	55	31483.93		0.549

Level	n	Mean	Std Dev	Minimum	Maximum
Co Chn	33	40.76	24.59	0	100
Pr Chn	8	56.86	20.34	40	90
Lrg Sg	6	47.50	27.34	15	90
Sm Btq	6	43.33	26.39	0	80
Mer Cg	3	48.33	10.41	40	60

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Size/Own	4	485.62	121.41	0.18
Error	51	34413.93	674.78	p > F
Total	55	34899.35		0.948

Level	n	Mean	Std Dev	Minimum	Maximum
Co Chn	33	28.53	26.93	0	100
Pr Chn	8	27.88	21.71	0	58
Lrg Sg	6	33.33	32.06	0	75
Sm Btq	6	22.22	20.18	0	50
Mer Cg	3	22.22	19.24	0	31

Table D-8 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Size/Own	4	1767.68	441.92	0.89
Error	51	25350.38	497.07	Pr > F
Total	55	27118.06		0.477

Level	n	Mean	Std Dev	Minimum	Maximum
Co Chn	33	16.16	24.82	0	100
Pr Chn	8	10.42	17.11	0	42
Lrg Sg	6	6.94	13.35	0	33
Sm Btq	6	9.72	9.74	0	25
Mer Cg	3	33.33	33.33	0	67

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Size/Own	4	406.77	101.69	0.20
Error	51	25977.15	509.36	p > F
Total	55	26383.93		0.937

Level	n	Mean	Std Dev	Minimum	Maximum
Co Chn	33	21.59	21.03	0	75
Pr Chn	8	23.44	27.09	0	75
Lrg Sg	6	29.17	17.08	0	50
Sm Btq	6	22.92	20.03	0	50
Mer Cg	3	29.17	40.18	0	75

Table D-8 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Size/Own	4	1425.19	356.29	0.24
Error	51	74277.94	1456.43	Pr > F
Total	55	75703.13		0.912

Level	n	Mean	Std Dev	Minimum	Maximum
Co Chn	33	42.42	38.27	0	100
Pr Chn	8	46.88	41.05	0	100
Lrg Sg	6	29.17	36.79	0	100
Sm Btq	6	37.50	34.46	0	75
Mer Cg	3	33.33	38.19	0	75

Table D-9

Analysis of Variance of Quick Response Factors for Relationship with Retailer

Factor 1

Source	df	Sum of Squares	Mean Square	F Value
Relation	3	3346.46	1115.49	1.87
Error	57	33989.60	596.31	Pr > F
Total	60	37336.07		0.145

Level	n	Mean	Std Dev	Minimum	Maximum
Lead	18	54.72	27.30	0	100
Follow	34	38.23	21.03	0	85
Ignore	1	45.00	.	45	45
Other	8	39.38	30.99	0	90

Factor 2

Source	df	Sum of Squares	Mean Square	F Value
Relation	3	505.69	168.57	0.24
Error	57	40140.93	704.23	p > F
Total	60	40646.63		0.869

Level	n	Mean	Std Dev	Minimum	Maximum
Lead	18	29.17	29.32	0	100
Follow	34	29.98	23.37	0	91
Ignore	1	8.33	.	8	8
Other	8	29.17	32.73	0	83

Table D-9 (continued)

Factor 3

Source	df	Sum of Squares	Mean Square	F Value
Relation	3	3456.18	1152.06	2.68
Error	57	24483.25	429.53	Pr > F
Total	60	27939.44		0.055

Level	n	Mean	Std Dev	Minimum	Maximum
Lead	18	22.22	30.72	0	100
Follow	34	10.78	15.69	0	50
Ignore	1	41.67	.	41	42
Other	8	2.08	3.86	0	8

Factor 4

Source	df	Sum of Squares	Mean Square	F Value
Relation	3	684.67	228.22	0.39
Error	57	33511.03	587.91	p > F
Total	60	34195.69		0.762

Level	n	Mean	Std Dev	Minimum	Maximum
Lead	18	25.00	22.28	0	75
Follow	34	25.37	22.71	0	75
Ignore	1	0.00	.	0	0
Other	8	21.88	33.91	0	100

Table D-9 (continued)

Factor 5

Source	df	Sum of Squares	Mean Square	F Value
Relation	3	1140.65	380.22	0.28
Error	57	77117.54	1352.94	Pr > F
Total	60	78258.19		0.839

Level	n	Mean	Std Dev	Minimum	Maximum
Lead	18	34.72	36.52	0	100
Follow	34	39.71	36.47	0	100
Ignore	1	50.00	.	50	50
Other	8	28.13	38.82	0	100