

QR 효과 인지도와 QR 도입의 관계 연구

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A Study of Relationship between the Perception of QR Benefits and QR Adoption

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Abstract

본 논문의 목적은 Rogers의 혁신도입이론(1983)을 이론적 배경으로 하여, QR 효과와 QR 도입의 관계를 규명하고, QR 도입/미도입의 이유를 조사하였다. 조사대상은 미국 전역에서 무작위로 추출된 306개의 의류업체를 대상으로 설문조사를 실시하였다. 설문응답률은 47% (n=103)였고, 자료의 분석은 기술통계와 비모수통계기법을 사용하였다.

QR 효과를 높게 지각하는 대상기업이 QR 도입기업으로 분류되었다. 설문응답 기업의 94%가 QR 도입은 변화하는 시장수요에 대한 대응력과 재공품의 감소효과를 제공한다고 응답했다. QR 도입효과를 지각하면서도 QR을 도입하지 못한 가장 큰 이유는 QR의 초기투자비용 때문인 것으로 나타났다. 정부차원의 의류중소기업 지원대책 마련 방안과 정확한 QR 교육이 시급하다.

I. Introduction

Quick Response (QR) has been considered as an appropriate strategy for apparel manufacturers and retailers in the competitive environments. Quick Response (QR) is as a new business strategies to speed the flow of information and merchandise between retailers and manufacturers of apparel and textiles (Ko, 1993, 1995; Ko & Kincade, 1997a, 1997b; VICS, 1989). This strategy can increase the speed and accuracy of the industry's response to the consumer.

QR has been adopted by approximately 40% of U. S. apparel manufacturers (Kurt Salmon Association [KSA], 1992). Although QR has been perceived as a profitable strategy, the number of QR adopters has not changed much since 1988 (Gillease, 1988; KSA, 1992). The purpose of this study is to examine the relationship between the perception of QR benefits and QR adoption, and to examine the reasons for QR adoption/non adoption. Perception of QR benefits, is considered as an important factor to adopt innovation according to the Rogers' adoption theory (1983).

The findings of this study implies the importance

of information sharing and the education of new technologies. Information about identified reasons for QR adoption and QR non adoption assists industry trade associations to adjust their strategies to promote QR adoption by apparel manufacturers.

II. Adoption Theory

In the Rogers' adoption theory (1983), adoption is a decision to make full use of an innovation as the best course of action available. Adoption occurs at the decision stage in the innovation-decision process. The adoption of innovations has been studied about factors influencing innovation adoption. Previous studies have shown that adoption of innovation is affected by several factors: firm size, organizational strategy, product category, and perception of innovation benefits (Ettlie, Bridges, & O'Keefe, 1984; Kincade, 1989; Ko, 1993, 1996; Ko & Kincade, 1997a, 1997b; Mansfield, 1968, 1983; Miles & Snow, 1978; Office of Technology Assessment, 1987; Rogers, 1983; Whately, 1985; 고은주, 1996).

Specifically, perception of innovation benefits was related positively with adoption of numerical control in the tool and die industry (Mansfield Rapoport, Schnee, Wagner, & Hamburger, 1971), not in apparel industry. Relative advantage of innovation adoption has been investigated as a factor influencing the adoption of innovation (O'Callaghan, Kaufmann, & Konsynski, 1992; Rogers, 1983). Since the apparel industry is fragmented with limited communication among competitors, information about innovations is not as easy to access as it is in other industry.

Other factors that have been studied include the attributes of innovations, characteristics of the adopter, and external influences. Attributes of innovations (i.e., relative advantage, trialability, compatibility, observability), and characteristics of adopter, such as education, age, and leadership, are related with the adoption process (O'Callaghan et

al., 1992; Rogers, 1983; Robertson, Zielinski, & Ward, 1984).

III. Perception of QR Benefits

QR can provide domestic apparel companies with strategic competitiveness. Benefits often cited in the literature (AAMA, 1987; Bravman, 1992; Braithwaite, 1990; Ernst & Whinney, 1988; Hunter, 1990; Kincade, 1989; Ko, 1993, 1995, 1996; KSA, 1986, 1987; Sullivan, 1990; VICS, 1989; 박동준, 1996; 최경주, 1996; 한국섬유산업연합회, 1995) are as follows:

(1) reduction of inventory levels, (2) lead time reduction, (3) cost reduction, (4) productivity improvement, (5) flexibility to meet changing market demand, (6) reduced work-in-progress, (7) increased market share, (8) customer loyalty, (9) reduced markdowns, (10) increased profits, and (11) increased return-on-assets.

First, reduction of inventory levels. While initial implementation may actually drive up manufacturer's inventories as retailers look for faster fulfillment of orders, QR can reduce inventories by providing the information required to optimize production and distribution planning (KSA, 1986, 1987). Reduction of inventory level was examined as a QR benefit in previous studies (Bravman, 1992; Kincade, 1989; Sullivan, 1990). Sullivan (1990) found 75% of QR adopters had reduced inventory levels through QR.

Second, lead time reductions. Lead time is the period between the placement of an order for products and the firm's receipt of products (Johnson & Wood, 1990). As product life cycles become shorter and products become quickly obsolete, companies have to strive for short lead time in producing goods. Companies lag behind the competitors if they do not offer what the customers want within a reasonable lead time. QR shortens lead times by using small-lot quantities, CAD, reduction of redundant testing, and short cycle manufacturing

(Braithwaite, 1990; Hunter, 1990; Kincade, 1989; Sullivan, 1990; Tyler, 1991).

Third, cost reduction and productivity improvement. By eliminating some forms of waste arising from the apparel pipeline, QR enables companies to reduce costs (Ernst & Whinney, 1988; Hunter, 1990). A study by KSA (1986) found that QR, especially in fashion goods, lowers operating costs per unit. Through a partnership agreement, ~~redundant testing~~ is eliminated with corresponding reduction of the testing expenses.

QR increases productivity and improves operating controls to reduce overall costs. Wastes (e.g., inventory, wait-time, defects, unnecessary movement or transportation, and overproduction) are eliminated when adopting a QR strategy (Hunter, 1990). Elimination of these wastes reduces inputs, and, by definition, this increases productivity.

Producing high quality products within a reasonable lead time is necessary, but not sufficient, in today's fiercely competitive market. The tremendous cost reduction through QR enables companies to compete favorably in the marketplace. Price is a critical strategic weapon. The price of a product is determined by the market, not the producers, but companies try to reduce production costs to make a reasonable profit margin (Bard & Moore, 1990; Chambers, 1991; Gunston & Haworth, 1990; Moylan, 1991; Noble, 1989). Although the capital investment may be large, companies implementing QR can gain a strategically advantageous position, when they reduce production costs by reducing capital input per unit production (Hunter, 1990). Pilot studies have shown that the improved sales generated through better target of product positioning increased sales volume with resulting lower overhead per unit production (AAMA, 1987; KSA, 1986).

Fourth, flexibility to meet changing market demand and reduced work-in progress. Today's consumers have become not only more sophisticated and diversified, but also more demanding. QR

systems' flexibility offers adaptation to changing market demands through small-lot productions and orders (Ernst & Whinney, 1988; Hunter, 1990; Kincade, 1989; Ko, 1993, 1995, 1996; Sullivan, 1990). For example, a flexible manufacturing system helps to produce small quantities with various styles by changing product planning for responding to market tastes. Small-lot production of QR is targeted toward "economy of scope" rather than "economies of scale" of the mass production systems (Hunter, 1990). Unit production system (UPS) allows manufacturing to be more to customer order and less to stock (Hunter, 1990).

Fifth, increased market share and customer loyalty. Bravman (1992) and others (Kincade, 1989; Sullivan, 1990) discussed that retailers who have built QR programs will give preference to suppliers who can support a QR partnership. Manufacturers who implement QR will take business away from those who do not. Bravman (1992) and others (Ernst & Whinney, 1988; Kincade, 1989) also indicated that a QR partnership can maintain a long term relationship between manufacturers and retailers.

Sixth, reduced markdowns, increased profits, and increased return on assets. These financial benefits are possible with QR (Braithwaite, 1990; KSA, 1987; Sullivan, 1990; VICS, 1989). Markdowns are reduced and profits are increased because products are produced by responding to the consumer demand and preferences. A pilot study by the Crafted with Pride Council and AAMA (1987) demonstrated positive financial returns with QR.

IV. QR Adoption

Ernst and Young (1990) found that, although 88% of the respondents thought QR has potential benefit to textile and apparel industries, less than 50% of U.S. apparel manufacturers have adopted QR. KSA study (1992) indicated that the adoption level of QR

has had a limited increase since 1988, and apparel manufacturers' adoption of QR has remained about 40%. Some companies have adopted QR and others have not. The financial benefits were shown by actual studies, but the QR adoption level is still limited (AAMA, 1991; KSA, 1990). Other reasons besides financial benefits might influence the adoption of QR in apparel manufacturing companies. Reasons for reluctance to adopt QR included lack of standardization, lack of knowledge and information, investment costs, and insufficient cooperation among industry segments (Ernst & Young, 1990). In a study of North Carolina apparel manufacturers, most manufacturers had implemented some level of one or more QR technologies, but few manufacturers had implemented all five components of QR (Kincade, 1989). Companies had adopted different types of QR technologies depending on specific needs.

Gunston and haworth (1990) showed that an apparel firm reduced a four week cycle in garment making to one week by eliminating duplicate inspection of piece goods and by instituting rapid-change planning and operating procedures. Suppliers of fabrics inspect piece goods and record data on defects by computer, and this information allows the apparel companies to plan its cuts in advance of shipment and to specify the sequence in which specific rolls are to be spread and cut.

KSA (1990) has done 100 pilot studies about QR, and each has shown significant benefits. J.C. Penney, Oxford, and Burlington with QR adoption in tailored clothing increased sales by 59% and inventory turns to 90%. In Wal-Mart, Seminole, and Milliken, both sales and inventory turns of basic slacks were increased by 31%, while sales and inventory turns of blouses through Dilliard's and Cluett Peabody companies were increased by 42% and 45%.

KSA (1990) also reported actions to implement QR by apparel manufacturers. The investment in

QR systems for basic products entails sophisticated merchandise control systems based on POS data and changes in receiving and shipping procedures. As a result of the investment, manufacturers can get higher sales and an advantage in customer service. The higher risk of maintaining inventories of finished or semi-finished goods in fashion products makes short-cycle, flexible manufacturing more appropriate. Investing in short-cycle, flexible manufacturing improves results by reducing costs for inventory, manufacturing, and space usage while improving quality and employee involvement. QR in fashion products can generate greater sales and profit increases.

V. Research Hypothesis

H: QR adoption is related to the perception of QR benefits.

In the Rogers' adoption theory (1983), adoption occurs at the decision stage in the innovation-decision process. The adoption of innovations has been studied about factors influencing innovation adoption. Previous studies have shown that adoption of innovation is affected by several factors (e.g., firm size, organizational strategy, product category, and perception of innovation benefits). But, perception of innovation benefits was related positively with adoption of numerical control in the tool and die industry (Mansfield Rapoport, Schnee, Wagner, & Hamburger, 1971), not in apparel industry. Relative advantage of innovation adoption has been investigated as a factor influencing the adoption of innovation (O'Callaghan, Kaufmann, & Konsynski, 1992; Rogers, 1983).

VI. Research Method

1. Sampling and Data Collection

The target population of this study is U.S. apparel manufacturers. A random sample of 306

apparel manufacturers without locational limitation were selected from a list purchased from the Polk Co. The sample was stratified by firm size (i.e., number of employees) and product category (i.e., women's, men's, children's wear). Equal numbers were selected from each stratum. The total design method by Dillman (1978) was adopted for data collection. The questionnaire was pilot tested by a group of five individuals currently working in apparel firms and with selected faculty including Extension Specialists in the Department of Clothing and Textiles at Virginia Polytechnic Institute and State University. Participants in the pilot test confirm the major constructs as defined by researcher. No change was indicated by the participants. Kruskal-Wallis test and t-test were employed for hypothesis testing. The statistical significance level was set at .05.

2. Instrument

Question include the perception of QR benefits, QR adoption, reasons to adopt or not to adopt, and firm characteristics (e.g., firm size). **The perception of QR benefits** was measured by summation of the score from rating each listed benefit. Respondents were asked to rate each benefit by circling from 0 (not at all) to 5 (very much). Eleven benefits were selected from the academic research and industry sources. The QR benefits listed were reduction of inventory levels, lead time reduction, cost reduction, productivity improvement, flexibility to meet changing market demand, reduced work-in-progress, increased market share, customer loyalty, reduced markdowns, increased profits, and increased return-on-assets (AAMA, 1987; Braithwaite, 1990; Bravman, 1992; Ernst & Whinney, 1988; Hunter, 1990; Kincade, 1989; KSA, 1986, 1987; Sullivan, 1990).

QR adoption was measured by asking if QR had been adopted. The QR definition was given as follows:

QR is defined as a new business strategy to optimize the flow of information and merchandise between channel members in order to maximize consumer's satisfaction. This strategy is accomplished by close working partnership and new processes (etc. electronic reorder) in the manufacturing and distribution.

Reasons for QR adoption/non adoption were asked with an open end question. Firm characteristics were measured by firm size (i.e., number of employees) and product category (i.e., men's, women's, children's wear, others).

VII. Results and Discussion

1. Profile of Respondent Companies

The adjusted response rate was 47.0% for 103 usable responses based on the adjusted sample ($n=219$). One hundred and three responses were collected and grouped by firm size and product category. All firm size of apparel manufacturers were included in the study. The most common firm size was over 500 employees (23.53%) and the least common firm size was 10–19 employees (9.80%). The three product categories (i.e., women's [35.29%], men's [23.53%], children's wear [32.35%]) were equally represented. The others category (8.82%) has nine respondents which were identified as four sportswear firms, two swimwear firms, two shirts firms, and one uniform firm.

2. Hypothesis Testing

Two sample t-test and Kruskal-Wallis test were employed and the results are shown in Table 1. Perception of QR benefits was measured by the

Table 1. Comparisons of Perception of QR Benefits between QR Adopters and Nonadopters

	n	Mean	Std Dev	t	p
QR Adopters	49	41.22	9.71	7.05	0.0001
QR Nonadopters	30	24.43	10.58		

Table 2. QR Benefits Reported in Percent of Responses

(N=103)

QR Benefits	Not at all						Very much	N/A*
	0	1	2	3	4	5		
Reduction of inventory control	8.70	1.09	13.04	29.35	20.65	27.17	11	
Lead time reduction	6.83	3.41	9.09	26.14	23.86	30.68	15	
Cost reduction	14.44	6.67	13.33	18.89	17.78	28.89	13	
Productivity improvement	7.61	4.35	15.22	20.65	31.52	20.65	11	
Flexibility to meet changing market	5.43	3.26	11.96	18.48	27.17	33.70	11	
Increased market share	15.73	7.87	11.24	20.21	31.46	13.48	14	
Customer loyalty	8.89	4.44	14.44	23.33	25.56	23.33	13	
Reduced markdowns	11.76	5.88	20.00	15.29	28.24	18.82	18	
Increased profits	6.90	8.05	14.94	32.18	17.24	20.69	16	
Increased return-on-assets	5.81	10.47	15.12	32.56	13.95	22.09	17	
Reduced work-in-progress	5.75	10.34	20.69	16.09	20.69	26.44	16	

N/A* = No Answer

summation scores of 11 questions about QR benefits. Significant associations between perception of QR benefits and QR adoption from two sample t-tests ($p < .01$) and Kruskal Wallis test ($\chi^2[1, n=79] = 33.56, p < .01$). Research Hypothesis was accepted.

QR adopters ($m=41.22$) had higher mean scores than nonadopters ($m=24.43$). Frequency distribution for percentage on perception of QR benefits is shown in Table 2. QR adopters were expected to have more positive perceptions of QR benefits than nonadopters. Over 94% of responding firms answered that QR reduces lead time and increases flexibility to meet changing market and return-on-assets. Only about 15% of responding firms answered that QR does not increase market share and does not reduce cost. This result is consistent with Roger's adoption theory (1983). Sullivan (1990) found that 48.8% of respondents with QR adoption did not perceive the reduction of cost as a QR benefit. This study showed that only 14.44% of respondents did not perceive the cost reduction as a QR benefit. This result shows an increase in knowledge of QR benefits by apparel manufacturers.

3. Reasons for QR Adoption and Nonadoption

In the questionnaire, a QR definition was given. Respondents were asked whether they had adopted QR or not and to provide reasons for adoption/nonadoption. Major reasons for adopting QR or nonadopting QR are given in Table 3. Reasons for adopting QR were divided into eight categories, which were: to be competitive in market; to respond faster to orders; required by customer; to grow business and increase profitability; to meet market demand; to have good quality product; to reduce inventory; to develop partnership. These eight reasons were explained by one of 11 QR benefits in the literature review: reduction of inventory, lead time reduction, cost reduction, productivity improvement, flexibility to meet changing market demand, reduced work-in-progress, increased market share, customer royalty, reduced markdowns, increased profits, and increased return-on-assets (AAMA, 1987; Bravman, 1992; Ernst & Whinney, 1988; Hunter, 1990; KSA, 1987; Sullivan, 1990).

Reasons for not adopting QR were: not applicable to the firm task, lack of QR information, and too

expensive. Twenty-three percent of firms said that QR is not applicable to their firms, because they are contractors or jobbers. They are depending on the management system of manufacturers. Thirty-six percent of firms gave investment costs as the reason not to adopt QR. They had too small of a business to invest money for long term planning. Thirteen percent of the firms did not know about QR. These results supports information from the previous studies. Ernst and Young (1990) said that reluctance to adopt QR were lack of standardization, lack of knowledge and information, investment costs, and insufficient cooperation among industry segments. Sullivan (1990) divided the reasons not to adopt QR into four categories: (1) lack of information about QR, (2) QR was not suited to the product life-cycle, (3) QR was not suited to management practices, and (4) the costs of QR versus benefits were a deterrent to adoption.

Table 3. Reasons for Adopting and Nonadopting QR

Reasons	n	%
Adoption		
To be competitive in market	9	15.25
To respond faster to orders	7	11.86
To be required by customers	7	11.86
To grow business and increase profit	7	11.86
To meet market demand	4	6.78
To have good quality product	3	5.08
To reduce inventory	1	1.70
To develop partnership	1	1.70
No answer	20	33.89
Total	59	100.00
Nonadoption		
Not applicable to the firm task	9	23.08
Too expensive	14	35.90
Lack of Information	5	12.82
No answer	11	28.21
Total	39	100.00

VIII. CONCLUSIONS

To be competitive in the business environment, QR as a new business strategy in the apparel industry has been offered. When a firm adopts QR as an innovation, the knowledge of QR and its benefits are critical to help apparel manufacturers with strategic planning and evaluation of QR. The purpose of this study is to examine the relationship between the perception of QR benefits and QR adoption, and to examine the reasons for QR adoption/non adoption. The research hypothesis of this study was based on Rogers' adoption theory (1983) as related to the influences on QR adoption.

A significant relationship exists between perception of QR benefits and QR adoption. The higher the benefit perception level the firms had, the more often QR was adopted. This result is consistent with the Rogers' adoption theory (1983), and Hypothesis was accepted. One common reason for QR nonadoption was lack of knowledge about QR. Distribution of knowledge may not be fully accomplished, because of the limited nature of communication in the apparel industry.

QR information assembled in the review of literature and results of positive perception about QR benefits may encourage firms to adopt QR. QR adoption can assist firms to improve in utilization of resources and in service to the final consumer.

Results of this study show that only 45% of respondent firms have adopted QR although 85% of respondents perceived cost benefits of QR. This study implies that QR is an economic issue for the apparel industry. Nonadopters, especially small firms, might have financial problems as a constraint to QR adoption. Financial supports from trade associations and government are needed.

Further research areas are recommended from the results of this study. This study examined the variables related to QR adoption. Constraints for

QR adoption should be examined in another replication study. A total environmental approach for QR adoption needs to be done for the apparel industry.

QR was examined from the perspective of apparel manufacturers. Future research is needed to investigate the perspective of retailers and textile producers, because trading partners in the apparel complex are related. Specifically, identification of technologies used in retail stores and textile mills is needed for better channel service.

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