
The impact of quick response technologies on retail store attributes

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Abstract

In the competitive business environment, retailers can obtain profit by strategic planning and delivering consumer satisfaction. Quick response (QR) is a new business strategy to maximize consumer satisfaction by implementing new technologies (e.g. barcoding, scanner). Reports on research which aimed to identify the use of quick response technologies (QRT) and to identify store attributes that are improved by QRT. A convenience sample of 32 apparel retailers participated in this survey research; 26 retailers were selected at a QR trade conference and six small individual retailers were also selected from a south-east city. Finds that the most frequently cited store attributes that are improved by QRT were fast turnaround of goods and reduced stockouts. Both the use of QRT and improvement level of store attributes differed by store type.

Introduction

In a competitive business environment, retailers can obtain profit in return by delivering satisfaction through improved store attributes. A balance between their ability to meet consumers' needs satisfactorily and ability to operate a store effectively and efficiently[1]. To achieve both operational efficiency and retaining effectiveness, quick response (QR) is a proposed management strategy in the apparel industry. QR is defined as "a new business strategy to optimize the flow of information and merchandise between channel members to maximize consumer satisfaction" [2, p. 20].

The QR strategy is accomplished by implementing QR technologies (QRT). QRT includes a variety of activities such as electronic data interchange (EDI), barcoding, and point-of-sale data capture. The impact of QRT on some store attributes (e.g. decreased stockout rate) is evident[3]; however, relationships between QRT and other store attributes are not so clearly defined. Retailers are making large capital investments in technologies to implement QR[4]. Understanding use of QRT and its impacts on store attributes of apparel retailers is critical to evaluate results of strategic planning.

Strategic retail planning

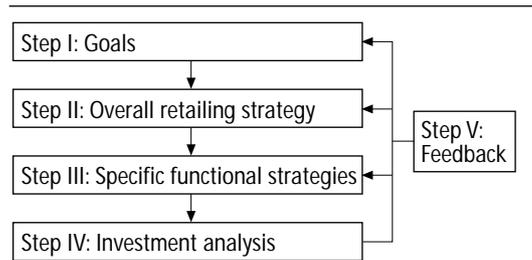
Strategic planning is defined as "a process of developing and implementing a course of action or direction that an enterprise should take to achieve its objectives. The strategy is the course of action while plan is the detailed set of tasks to achieve the objectives" [5, p. 209]. The strategic planning process affects what products a company develops and the way it develops them. From the literature[5,6], the strategic retail planning model includes five steps:

- (1) goals;
- (2) overall retailing strategy;
- (3) specific functional strategy;
- (4) investment analysis; and
- (5) feedback (see Figure 1).

Strategic planning addresses the analysis of the environment to maximize corporate strengths, to minimize corporate weaknesses, and to maintain a competitive edge by adapting the firm to environment[7-10].

Strategic planning affects the adoption of specific strategies (e.g., QR) and the performance of the firm. When implementing the

Figure 1 Strategic retail planning model



Source: [5,6]

new business strategy of QR in apparel retailing companies, functional strategies can be divided into:

- QRT-based strategies which are specific to QRT implementation (e.g. EDI); and
- non-QRT-based strategies which are more related to physical environment (e.g. display, store hours, parking place).

Functional strategies (e.g. QRT) affect specific store attributes, which are related to consumer satisfaction, within a store. By implementing QRT, store attributes may be improved (see Figure 1).

When the financial results of the strategic period are measured, the revenue of the current products and services in the marketplace provide the cash flow profit contribution. Through an investment analysis, specific functional strategies should be evaluated and revised continuously. Evaluating the effect of new technologies will be important to retailers. Maintaining a retailer's competitive advantage and long-term profitability will rely on the integration of consumer satisfaction into the retailer's strategies and operations[6]. This last feedback step brings management full circle so that the updated plan can be used as input to develop new corporate goals for the next strategy cycle.

The purpose of this research was to:

- identify the use of QRT;
- identify store attributes that are improved by QRT;
- examine differences in QRT use by store type (i.e. department store, speciality store, discount store, small independent store); and
- examine differences in improvements of store attributes by store type.

An overview of the apparel retailing industry

Retailing is defined as the business activity of selling goods or services to the final

consumer[1]. Apparel retailers buy fashion merchandise from manufacturers all over the world and sell it to consumers in their stores[11]. Among the two million retail firms in the USA, 135,000 retailers specialize in fashion apparel and accessories and 70,000 include apparel and accessories among other merchandise[11]. Successful retailers focus on identifying the characteristics, needs and wants of specified consumer groups to offer products and services that will provide satisfaction.

Store type

By the variety and assortment of their merchandise, retailers are often classified as: speciality chain stores, department stores, and mass merchants or discount stores[10-12]. Kotler[13] included into retail classification a small section of other chains and individual operations. Speciality chain stores provide a narrow focus of unique merchandise for specific tastes. Department stores sell apparel and accessories along with household goods and electronics. Mass merchants or discount stores are the largest stores that sell commodity merchandise in a department store format[11]. Small individual stores carry very limited merchandise but provide convenience of location and friendly personnel to keep customer loyalty.

Kincaide and Cassill[14] used the retail classification by Kotler[13] for their study to examine the effects of retail type on QR adoption among US apparel manufactures. The retail type was categorized as department, limited line, mass merchants, and others. They found that retail type significantly influences QR adoption. Shim and Kotsiopulos[15] categorized retail store types as discount, speciality, department, and catalogue stores for examining the relationships between patronage behaviour and shopping orientation, store attributes, information sources, and personal characteristics. All four consumer variables had predictability of choosing among store types for apparel shopping. Store type has been expected as a major determinant on innovation adoption and strategy development[6].

Quick response technologies

Major QR objectives are to reduce waiting time of inventory in the apparel pipeline by using new technologies, to develop improved partnership between apparel manufacturers

and retailers, and to prepare products in response to consumer demand[3, 14, 16, 17]. To accomplish the objectives of QR, retailers must use a variety of technologies[3,4]. Technology includes the use of new equipment and new process; however, all technologies do not require equipment and capital investment[18]. The use of barcoding at point of sale (POS) is one example of how QRT can be used to reduce stock-outs and improve customer service. Pilot studies have shown that ability to replenish merchandise in a short reorder time can reduce inventory investment and can increase sales.

QRT have been identified from industry sources[19-22] and research studies[2, 3, 14, 23,24]. The 12 most commonly mentioned retail QRT are:

- (1) automatic replenishment;
- (2) barcodes on each merchandise;
- (3) consumer information system (e.g. demographics);
- (4) electronic data interchange;
- (5) electronic purchase reorder;
- (6) inventory management systems;
- (7) product planning with customer;
- (8) reduction in inventory size;
- (9) sales captured at the item level;
- (10) scanning merchandise at POS;
- (11) sharing product information; with trading partners; and
- (12) small lot orders.

Store attributes

Store attributes are important to consumers when they make the decision where to shop[25-28]. Store attributes are presented by retailers according to their specific functional strategies. Store attributes must be offered that are desired by the targeted consumer. The challenge to retailers is to determine which store attributes are relatively more important to the targeted consumer. Providing appropriate store attributes is not enough to satisfy consumers and guarantee store loyalty. Maintaining the quality of these attributes is the hardest task and critical to survival in the competitive nature of fashion retailing.

The impact of QRT on store attributes

QRT create value for consumers and change the relationship with consumers and trading partners[3, 16]. Successful retail operations depend on a store's ability to meet consumer's

Table I Store attributes

Time/availability	Store environment	Value-added service
Reduced stockouts	Quality merchandise	Better price for the value
Variety of assortment	Right merchandise type for target market	Garment fit
Fast turnaround of goods		Return policy
Availability of advertised product	Friendly personnel	Home delivery
Accuracy of product	Convenient store layout	
Advertisement		
Faster checkout time		

needs; therefore, changes in store attributes, should be emphasized in retailers' strategic planning[6]. In all, 14 store attributes which may be improved by QRT, have been identified from industry sources[4, 16, 29-34] and academic studies[3, 23, 24, 35]. According to the nature of store attributes, these 14 store attributes identified from the literature can be grouped into three categories:

- (1) time/availability;
- (2) store environment; and
- (3) value-added service (see Table I).

Time/availability

One important aspect to retailers is having the product in stock at the time and place desired by the consumer[36]. Pilot studies show that by using QRT to anticipate and understand customer behaviour better, retailers are able to reduce the number of stockouts situations, achieve better placement of items in the stores, and increase personalized promotions[3, 16, 37]. Short reorder time, in pilot studies, reduced retailer initial inventory investment and increased sales by providing the stock throughout the season[16]. QRT offers ways for retailers to adapt to changing market demands[23, 24, 31, 32].

Store environment

Producing high quality products within a reasonable lead time is necessary, but not sufficient, in today's fiercely competitive market[36]. Providing quality merchandise in a convenient and friendly atmosphere is also needed[32]. Retailers try to improve sales and develop better store image through quality merchandise, right merchandise type for target market, friendly personnel, and convenient store layout. Friendly personnel distinguish one store from other stores. QRT, through

inventory management systems, can reduce the time for inventory control and ordering; therefore, retailers should have more time for in-store service. Convenient store layout is also enhanced by reduction in inventory size. Well spaced merchandise and price-marked shelves or products allow consumers to find products easily[6]. Inventory management systems can be combined with graphics packages to provide retailers with visual displays of inventory levels and placements.

Value-added service

Price is a critical strategic weapon in a competitive environment. The price of a product is often determined by the market, not the producers[38,39]. Although the capital investment may be large, companies implementing QRT can gain a strategically advantageous position, by reducing capital input per unit production[32]. Pilot studies showed reduced markdowns, increased profits, and increased return on assets are possible with implementation of QRT[4,16,24,30,33,34]. By eliminating some forms of waste arising from the apparel pipeline, QRT enable companies to reduce costs[31,32]. Retailers with strong partnerships can operate within a strategy of collaboration. Sharing product information with partners and electronic purchase reorder improve production of quality, targeted merchandise and provide the home delivery service by shipping goods directly from manufacturers. This strategy may improve not only getting the right goods at the first time but also reducing returns.

Research hypotheses

- H1:* Use of QRT differs by store type (i.e. department store, speciality store, discount store, small independent store).
- H2:* Improvement of store attributes (e.g. stockouts) by use of QRT (e.g. barcoding, scanner) differs by store type (i.e. department store, speciality store, discount store, small independent store).

Research method

The interview survey method was used to identify the use of QRT, to identify store attributes which are improved by QRT, and to examine usage level of QRT and improvement level

of store attributes (e.g. stockouts) by different store types (i.e. department store, speciality store, discount store, small independent store).

Sampling and data collection

A convenience sample of 32 apparel retailers were selected for the study. A total of 26 retailers were selected and interviewed at a professional meeting, QR conference in Atlanta, Georgia. This meeting is the biggest retail trade conference for developing a better QR strategy and providing prime networking and information sources. Those retailers who attend this conference are experts (e.g. QR system managers, QRT developers); therefore, they are knowledgeable about QRT. Three store types of apparel retailers (i.e. department store, speciality store, discount store) were available in this QR conference sample. Six small independent apparel retailers were also selected from a south-east city to include all types of stores as itemized in the literature. The small convenience sample was used, but more importantly all types of store were included. Store types as represented in the study were department stores (41 per cent), discount stores (28 per cent), small individual stores (19 per cent), and speciality chain stores (13 per cent).

Instrument

An interview instrument was developed for the study. Questions included usage level of QRT, improvement level of store attributes by QRT implementation, and store type. The questionnaire was pilot tested with a group of five selected retailers, not in the final sample, and faculty members at a major university. Through this pilot test, face reliability and content validity in the questionnaire were evaluated. Participants in the pilot test confirmed the major constructs as defined by the researcher.

Use of QR

QRT use was measured by the reported use of 12 QRT. In all, 12 QRT were selected as those most commonly cited in the literature. For each item, the respondent was asked to select the use of technologies on a scale from 0 per cent to 100 per cent or more. Use of QRT was measured by an average score of reported QRT use by respondent retailers.

Improvement of store attributes by QRT

This was measured by the reported improvement level of 14 store attributes by imple-

menting QRT. A total of 14 store attributes were included as most commonly mentioned store attributes which are improved by QRT in the literature. For each store attribute, the respondent was asked to select the improvement level of store attributes by implementing QRT on a scale from 0 per cent improvement to 100 per cent or more improvement. Improvement of store attributes by QRT was measured by an average score of improvement level as reported by respondents.

Store type

Store type was divided into four groups: department store, speciality store, discount store, and small independent store, as itemized in the literature. Apparel retailers were instructed to select the category which best represented their store.

Data analysis

Descriptive statistics (i.e. frequencies, percentages) were used to identify use of QRT and company demographics. For testing Hypotheses 1 and 2, one-way analyses of variance (ANOVA) were conducted to examine the difference of use of QRT and improvement of store attributes by QRT among different store types.

Results and discussion

Use of QR technologies

The use of QRT varied by apparel retailers (see Table II). The most frequently used technologies among all surveyed retailers were

sales captured at the item level (76.5 per cent) and scanning merchandise at point of sale (POS) (71.5 per cent). The least used QR technology was consumer information system (17.8 per cent). The most frequently used technology was:

- for speciality chain stores, scanning merchandise at POS (93.8 per cent);
- for discount stores, sales captured at the item level (94.4 per cent);
- for department stores, scanning merchandise at POS (86.5 per cent) and sales captured at the item level (86.5 per cent); and
- for small individual stores, sales captured at the item level (37.5 per cent).

Similar patterns in the most frequent QRT use existed among four store types; however, small stores used lower levels of all QRT.

For hypothesis testing, QRT use was further refined. To check unidimensionality of the measure about the use of QRT, principle Components Method of Factor Analysis was used. If the summation variable was homogeneous, all items would load on only one factor; however, two orthogonal factors resulted from the factor analysis. Factor loadings generated by rotated factor pattern were evaluated. Individual items, which loaded higher than 0.50 on that factor and lower than 0.30 on the other factors, were retained. Of the 12 QRT, nine QRT were significantly loaded on two factors (see Table III). To judge the strength of measurement of the underlying constructs, the two factors were also tested for reliability. Each factor

Table II Usage of QRT reported in percentage of responses by apparel retailers

QRT	Speciality chain	Department	Discount	Small individual	Total
Automatic replenishment	62.50	55.77	55.56	4.17	44.50
Barcodes on each merchandise	81.25	80.77	86.11	16.67	66.20
Consumer information system (e.g. demographics)	12.50	26.92	27.78	4.17	17.84
Electronic data interchange	68.75	63.46	66.67	0.00	49.72
Electronic purchase reorder	75.00	61.54	66.67	0.00	50.80
Inventory management systems	68.75	53.85	63.89	33.33	54.95
Product planning with customer	62.50	25.00	36.11	12.50	34.03
Reduction in inventory size	25.00	32.69	50.00	16.67	31.09
Sales captured at the item level	87.50	86.54	94.44	37.50	76.50
Scanning merchandise at point of sale	93.75	86.54	88.89	16.67	71.46
Sharing product information with trading partners	62.50	57.69	52.78	16.67	47.41
Small lot orders	12.50	11.54	11.11	12.50	11.91

had Cronbach's alpha value above 0.65, and was considered good measures[40]. Factor 1, information sharing, represents the dimension of QRT promoting improved communication between suppliers and customers. Factor 2, product inventory/ availability, represents the dimensions of QRT controlling inventory and offering product availability.

Improving store attributes by using QRT

The improvement of each store attribute by QRT varied by apparel retailers (see Table IV). Of the 14 store attributes identified from the literature, store attributes, that were perceived as the most improved by QRT, were fast turnaround of goods (70.3 per cent),

reduced stockouts (65.6 per cent), and availability of advertised product (64.1 per cent). Store attributes perceived as the least improved by QRT were home delivery (7.8 per cent), friendly personnel (8.6 per cent), and store layout (12.5 per cent). Similar patterns in the improvements by use of QRT existed among four store types. The top three most improved store attributes (i.e. fast turnaround of goods, reduced stockouts, availability of advertised product) were same for all store types; however, small individual retailers perceived improvements to be lower than improvements seen by other store type retailers.

For hypothesis testing, improvement of store attributes by QRT use was further refined. Through the same procedure used for developing the use of QRT factors, two factors were formed which contained ten of the 14 improvement items (see Table V). Factor 1, time/availability, represents improvements in time-related store attributes and availability of merchandise-related. Factor 2, store environment, represents the improvements in physical store environment and service-related attributes.

Tests of hypotheses

Hypothesis 1

Use of QRT differs by store type (i.e. department store, speciality store, discount store, small individual store).

The two factors of QRT use were information sharing and product inventory/availability. To examine the source and direction of

Table III Factor loading of use of QRT

Factor	Eigen Cronbach's		Loadings
	value	alpha	
Information sharing	6.31	0.86	
Automatic replenishment			0.59
Consumer information system (e.g. demographics)			0.82
Inventory management systems			0.86
Product planning with customer			0.85
Sharing product information with trading partners			0.65
Product inventory/availability	1.54	0.65	
Barcodes on each merchandise			0.64
Reduction in inventory size			0.50
Scanning merchandise at point of sale			0.88
Small lot orders			0.50

Table IV Improvement level of store attributes reported in percentage of responses by apparel retailers

Store attributes	Speciality chain	Department	Discount	Small individual	Total
Fast turnaround of goods	75.00	86.54	77.78	20.83	70.31
Return policy	12.50	23.08	25.00	16.67	21.09
Friendly personnel	0.00	3.85	22.22	4.17	8.59
Availability of advertised product	75.00	73.08	75.00	20.83	64.06
Variety of assortment	43.75	44.23	47.22	12.50	39.06
Accuracy of product advertisement	37.50	57.69	58.33	12.50	46.88
Better price for the value	37.50	28.85	55.56	20.83	35.94
Reduced stockouts	75.00	78.85	72.22	20.83	65.63
Garment fit	25.00	15.38	27.78	20.83	21.09
Store layout	0.00	11.54	19.44	12.50	12.50
Faster checkout time	37.50	59.62	55.56	16.67	47.66
Home delivery	0.00	7.69	5.56	16.67	7.81
Merchandise type for target customers	37.50	50.00	50.00	25.00	43.75
Quality merchandise	18.75	17.31	36.11	16.67	22.66

Table V Factor loading of improvements on store attributes

Factor	Eigen Cronbach's		Loadings
	value	alpha	
Time/availability	5.08	0.85	
Fast turnaround of goods			0.87
Availability of advertised product			0.76
Variety of assortment			0.74
Accuracy of product advertisement			0.63
Stockout			0.83
Faster checkout time			0.69
Store environment	2.56	0.65	
Friendly personnel			0.77
Store layout			0.88
Merchandise type for target customers			0.64
Quality merchandise			0.86

significance for the two factors among store type, ANOVA with LSMs data were analysed. From the first ANOVA, a significant difference existed in the information sharing by store type ($F[9, 28] = 3.74, p = 0.02$) (see Table VI). Speciality chain stores had the highest mean scores in use of information sharing ($m = 53.75$). Discount and department stores were similar in use of QRT, and small independent stores the lowest use of information sharing ($m = 14.17$).

A significant difference existed in the product inventory/availability factor by store type ($F[3, 28] = 25.99, p < 0.005$) (see Table VI). Discount stores have the highest mean scores in use of product inventory/availability ($m = 59.03$). Speciality chain and department stores were similar mean scores in use of product inventory/availability, and small individual stores had the lowest mean scores

in use of product inventory/availability ($m = 15.63$). This finding is consistent with previous studies of QRT use [2, 14]. Apparel manufacturers who have retail customers with speciality chain and discount stores had the higher QRT use than other store types of customers [14]. Retailers' technology implementation also depends on who are their partners and what they are using [14]. Small individual stores often do not have the capital to invest in the technology equipment needed for some QRT. Hypothesis 1 was not rejected.

Hypothesis 2

Use improvement of store attributes (e.g. stockouts) by usage of QRT (e.g. barcoding, scanner) differs by store type (i.e. department store, speciality chain store, discount store, small individual store).

The two factors of improvements in store attributes by QRT were time/product availability and store environment. From ANOVA analysis with LSMs, a significant difference was shown in the time/product availability when compared with store type ($F[3, 28] = 13.28, p < 0.005$) (see Table VI). Discount stores had the highest mean scores in improvements of time/product availability factor ($m = 59.72$). Department and speciality chain stores were similar mean scores in improvement of time/product availability, and small individual stores had the lowest mean scores in improvement of time/product availability ($m = 18.06$). No significant difference existed in improvements in store attributes of store environment factor by store type ($F[3, 28] = 1.03, p = 0.39$). Hypothesis 2 was not rejected.

Table VI Store type effect on factors in using QRT and improvements on store attributes: ANOVA results with LSMs

Variables	M				df	F
	Speciality chain	Department	Discount	Small individual		
Use of QRT						
Information sharing	53.75 ^a	43.84 ^b	47.22 ^c	14.17 ^{abc}	3	3.74*
Product inventory/availability	53.13 ^a	52.88 ^b	59.03 ^c	15.63 ^{abc}	3	25.88**
Improvements on store attributes						
Time/availability	55.21 ^a	59.29 ^b	59.72 ^c	18.06 ^{abc}	3	13.28**
Store environment	14.06	20.67	31.94	14.58	3	1.03

Notes:

A pair of means with the same superscript indicates a significant difference between two groups

* $p < 0.05$

** $p < 0.01$

Conclusions and recommendations

To be competitive in the retail business environment, apparel retailers have been offered a new business strategy, QR. The most frequently used technologies, among responding retailers, related to the use of POS information. Barcoding and scanning were used to capture product information at the unit level. QRT was most frequently cited as improving inventory and replenishment rates. Retailers perceived that implementation of QRT reduced stockouts and improved turn of goods. Improvement in these store attributes are important, because of the related improvement in profitability. Both the use of QRT and the improvement of store attributes by QRT differed by store type. Small independent stores had the lowest use of QRT and had the lowest perception score in improvement of store attributes. From additional interview questions, all small independent stores were found to have little knowledge about QRT and its improvements for their service; therefore, education programmes about QRT are needed for small apparel retailers[4,21].

Two of the least used technologies were consumer information system (e.g. demographics) and reduction in inventory size. QRT adopters more often use technologies which require expensive hardware (e.g. barcoding) rather than those activities which require only change in methods (e.g. product planning with the customers). Product planning with the customers has positive benefits with limited capital investment[23]. A little change in people's minds can bring companies high financial returns and customer loyalty. Barriers for changing and lack of use of small lot orders should be identified in the future research.

Retail QRT information assembled in the review of literature and the results from this empirical study provide direction for organizations which are developing QRT. Some QRT are widely used by apparel retailers. Other QRT have not been implemented. Planners should consider the differences among these technologies and potential barriers to implementation. The information is valuable to retailers who wish to evaluate the effects of their strategic planning. Changes in technologies and modes of retail operation can impact on store attributes. These attributes are seen by consumers. The implementation of QRT can have a positive effect on store attributes.

Generalization of these findings must be done with caution. The small, purposive sample may not be representative of the US apparel retail population. The retailers at the 1995 QR conference may be a specialized group of retailers who are drawn to the conference by their heightened interest in QR. However, the comprehensive information about QRT use and its impacts on store attributes from the research provides a basis for developing the further research with nation-wide survey. Second, reported QRT use may be higher than the actual use levels. The retailers at the 1995 QR conference may represent a more innovative group of retailers in implementation of QRT than common retailers, but from this study the future trend for technology adoption can be predicted for followers in QRT implementation.

Further research is recommended to explore the findings from this article. The factors for QRT use and for store attribute improvement should be examined with a broader sample. In addition, other variables may be selected for use as moderators to determine relationships between factors in further research (e.g. organizational structure, performance, communication channels, other external influences). The implementation level of QRT varied with the individual QRT activities. More information is needed about the perceived barriers and benefits for these items. The actual process of implementation and other impacts of this strategy should be examined.

QR was examined from the perspective of apparel retailers. Future research is needed to develop an integrated model, including the perspectives of manufacturers and textile producers, because trading partners in the apparel complex are related. Specifically, identification and standardization of technologies used by manufacturers and textile mills are needed for better channel service.

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