



## EXPERIMENTAL ANALYSIS ON INTERRELATING QUALITY AND WARRANTY TOWARDS NEW PRODUCT PROMOTION

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### ABSTRACT

Everything is changing very fast and unpredictably. This radical changes taking place due to globalization in reshaping the industrial landscape of world economies. Customers are requiring smaller quantities of more customized products such way that they are to be treated individually. So most companies have much wider product ranges and are introducing more new products more quickly. So due to this change, industries has to focus on marketing the product through post sale factors like advertisement, service, warranty and etc., In which warranty become information rich in the context of new products promotion since it can be used also as advertising tool. As better warranty signals leads to higher product quality and provides greater assurance to customers. Product warranty has received the attention of researchers from many different disciplines and there are many different aspects to warranty, a proper study of the subject requires a framework to integrate these in an effective manner. This paper highlights issues related to quality, warranties and examines consumer's perception on warranty with the objective of optimal utilization of warranty. An experimental analysis was done to which level quality is imposed to product, prior knowledge and the corresponding extra revenue generated to that of warranty. In which the result somewhat surprisingly suggest that, for experts, a better warranty leads to perceptions of higher quality, regardless of firm reputation. Tenderfoot on the other hand, tend to perceive a better warranty as a signal of higher quality only when the firm is reputable but not when its reputation is low

**Key words:** *Product Quality, Product Warranty, Consumer Perception, Prior Knowledge, Manufacturer Reputation*

### 1. Introduction

Modern manufacturing is characterized by (i) rapidly changing technologies, (ii) global markets, (iii) fierce competition, (iv) often nearly identical products due to common components and technology being used and, (v) better educated and more demanding customers. This has posed serious challenges for buyers, manufacturers and policy makers at international, national and regional levels. In the purchase decision of a product, buyers typically compare characteristics of comparable models of competing brands. When competing brands are nearly identical, it is very difficult in many instances to choose a particular product solely on the basis of the product related characteristics such as product price, special features, perceived product quality and reliability, financing offered by the manufacturer and so on. In such situations, post-sale factors such as warranty, parts availability and cost, service, maintenance, and so forth take on added importance in product choice. In which warranty play a vital role in post sale factors [1], [5], [9]. In this

connection it can also be noticed that, the second half of the twentieth century has seen dramatic changes in the role and the importance of warranty in relation to product sales and services. Four main factors responsible for this have been [5], [15]: (i) activism of the so called 'consumer movement' which resulted in greater awareness among consumers regarding their rights and the formation of strong and vocal groups to challenge manufacturers and force lawmakers to enact new laws to protect consumer interests; (ii) lawmakers responding to the concerns of consumers and their advocates; (iii) manufacturers acting in a reactive mode to (i) and (ii); and (iv) manufacturers initiating proactive actions using warranty as a powerful marketing tool. So for well-established products, the warranty serves a useful role in protecting consumer's interests. It often used as protectional, promotional, marketing tool [3], [4], [5].

Product sales may be accelerated by some signaling mechanism, which conveys information to reduce the uncertainty or risk perceived by the consumer. In which warranty serves as important one in

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such signaling mechanism. This paper explains how quality interrelates warranty in a positive aspect and to which level the quality and warranty should be applied in products. An experimental analysis was done with prior knowledge, firm reputation and analyses to which level it is imposed to product and the corresponding extra revenue generated to that of warranty.

## 2. Warranty Taxonomy

In a mass production industry, including automobiles, a product development process goes through various stages of the design cycle. The specifics of this cycle will vary from industry to industry and even from company to company, but in general this process will include the steps shown in Figure 1. The first three blocks of the diagram in Figure 1 (Quoting, Design and Validation) are directly affected by the product validation activities and the last two are related to warranty and affected by the activities of a reliability engineer in an indirect manner. Comprehensive analysis of these relationships will help to build a model, which can subsequently be optimized to minimize the life cycle cost.

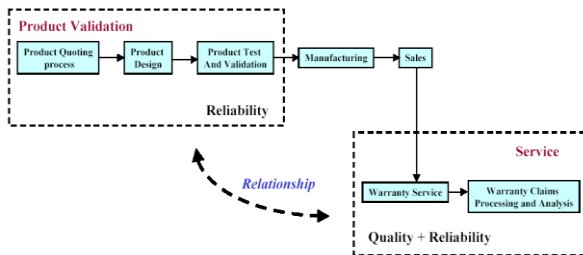


Fig.1 Process design cycle

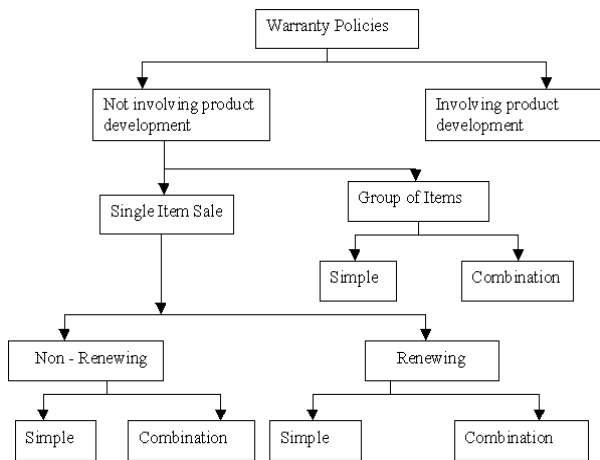


Fig.2 Warranty taxonomy

A warranty is a contractual obligation incurred by a manufacturer (vendor or seller) in connection with the sale of a product. In broad terms, the purpose of warranty is to establish liability in the event of a premature failure of an item or the inability of the item to perform its intended function [8]. The contract specifies the promised product performance and, when it is not met, the redress available to the buyer as compensation for this failure. A broad categorization [15] to group warranty policies is given in figure 2. The simple and combination warranty policies shown in figure 2 is further classified into one - dimensional and two - dimensional warranties. In which figure 3 shows one-dimensional warranty.

Nowadays automotive manufacturers sell vehicles with basic two-dimensional (time and mileage) warranty coverage and provide customers the option to buy an extended coverage. Most often automotive warranty is specified in terms of {T, X} where T denotes time period and X denotes mileage as shown in figure 4.

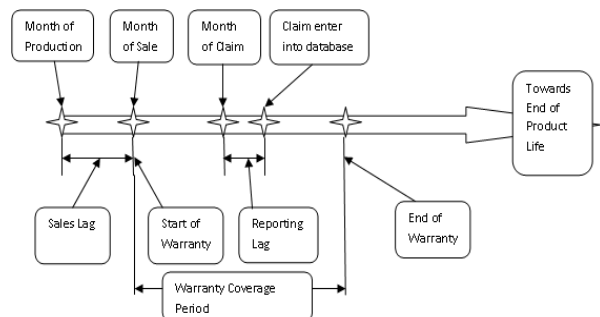


Fig.3 Warranty concept: One - dimensional

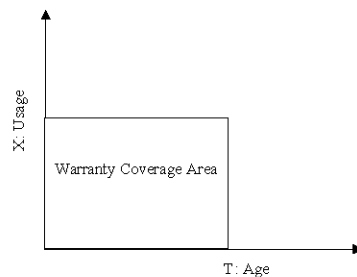


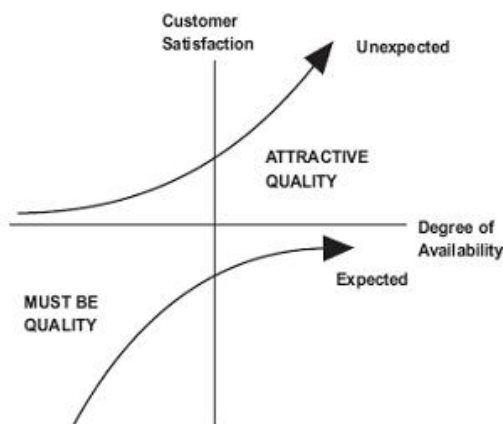
Fig.4 Warranty concept: Two - Dimensional

## 3. Quality and Warranty Interface

### 3.1 Quality aspects with customer

Different people have defined quality differently. The emphasis of quality has broadened to

focus on customers' needs. It is now quite common for organizations to publicize their slogans such as "customer first" and some have even established customer care units just to cater to the "voice of customer". What the customers actually want are the "solutions" to their needs and not just quality products. Organization should strive for delighted customers rather than just for satisfied customers. Customers need to be delighted in every aspect that concerns them including cost, delivery, service, and flexibility. Kano defines this quality orientation of customer needs as illustrated in figure 5. His model views quality in two dimensions, which are "must be quality" (to satisfy the expected needs) and "attractive quality" (the unexpected that delights customers) [18].



Source: Kano et al, 1984

Fig.5 Quality orientation of customer needs

### 3.2. Quality signals

Several quality indicators have been considered in economic literature. Kirmani and Rao [12] make a distinction between quality signals, which are default contingent, and those that are not. Default-independent signals are those in which the monetary loss occurs independently of whether the firm defaults on its claims. Advertising expenditures, reputation, brand investments and (introductory) pricing belong to this group. In contrast, default-contingent signals entail costs only when the firm did not adhere to its claims. This group's main representatives are all kinds of warranties and guarantees.

Warranties offer assurances of reliability. According to signal theory warranties can function as direct signals of product quality assuming rational competitors and consumers as well as perfect competition [2], [5], [13]. When competitors offer

different qualities and different warranty contracts this will result in a separating equilibrium if warranty contracts are fully enforced. More risk adverse customers will then buy from suppliers providing higher warranties [14], [16]. Recently even the use of an arbitration clause was taken into account as a signal of quality although this result is completely based on the consideration that an arbitrator could grant higher compensation than a court possibly including punitive damages. Then of course, an arbitration clause becomes costly and can serve as a quality indicator. But this is in fact the same as using a penalty clause in the first place. Of course, there are interdependencies among various quality signals. The warranty level for example depends on the product's reliability since lower product quality would result in higher costs for repair. Also, the chosen quality level determines the price because higher product quality would lead to higher manufacturing costs and the use and relevance of different quality signals depends on cultural differences too.

### 3.3. Warranty: manufacturer's perspective

A strong motivating factor for any manufacturer is the desire to maximize profits. Offering a warranty results in additional cost due to servicing of the warranty but at the same time, if used properly as a marketing tool, increases sales and hence revenue generation. Warranty servicing costs depend on product characteristics and the usage patterns of consumers. If the extra revenue generated exceeds the warranty servicing costs, then it is more sensible to sell the product with warranty. As a result, manufacturers are interested in the study of warranty in order to overcome the variety of warranty related problems the context of manufacturing, marketing and servicing.

### 3.4. Warranty: consumer's perspective

From the consumer's point of view [5], the main role of a warranty in these transactions is protectional – it provides a means of redress if the item, when properly used, fails to perform as intended or as specified by the seller. Specifically, the warranty assures the buyer that a faulty item will either be repaired or replaced at no cost or a reduced cost. A second role is informational. Many buyers infer that a product with a relatively longer warranty period is more reliable and long lasting than one with a shorter warranty period. However, consumer bureaus and regulatory agencies can carry out such analysis and inform the consuming public. Here too, data collection is often a serious problem.

#### 4. Interrelating Quality and Warranty

Research suggests that firms can use warranties as signals of quality when consumers are uncertain about a product's quality. A high-quality product will thus be accompanied by a warranty that provides better protection against product failure in terms of both scope and duration of the coverage, while a low-quality product should offer less warranty protection. The reason is that firms offering extensive warranty coverage will need to ensure high product quality in order to control warranty costs in the event of product failure. While a few empirical tests of the signaling theory have been reported in the literature [2], study is of particular relevance to the current research since it examined the implications of the economic theory from a consumer perspective. Their results suggest that consumers react to warranties in a manner that is consistent with the behavioral assumptions of the economic theory—warranty is used as a signal of product quality when the firm is reputed to manufacture high-quality products but not when the firm is reputed to manufacture low-quality products. In this paper, we reexamine Boulding and Kirmani's [2] findings in a context that allows an examination of the effects of prior knowledge on consumer's utilization of warranty information in evaluating product quality.

#### 5. Role of Prior Knowledge

Research on consumer knowledge suggests that the manner in which product-related cues are used in quality evaluations may depend on prior knowledge. Several studies have shown that in evaluating product quality, experts and tenderfoot attend to different kinds of information and also use the same information differently [10]. The extant research on cue utilization thus suggests that prior knowledge influences the extent to which different cues are used in assessments of product quality. For example, research has shown that prior knowledge affects how consumers use price as a signal of quality [11]. This research suggests that the extent to which an extrinsic cue is used in inferring product quality depends on its perceived diagnostic value. It is likely that the perceived diagnostic of warranty as a signal of quality varies with prior knowledge, particularly in the presence of other cues such as firm reputation, as in our experimental analysis. Although it is apparent that prior knowledge will influence warranty use, it is not clear how experts and tenderfoot will react to warranty information in the presence of a more salient cue—firm reputation.

A warranty offered by a firm with low reputation may receive less weight than when it is offered by a firm with high reputation. This implies those tenderfoots are likely to use warranty information as a signal of quality when the firm's reputation is high but not when it is low. In contrast, experts greater ability to discern relationships between each of the signals and product quality in isolation, allows them to interpret and integrate the information in an unbiased manner [10]. In other words, experts are able to interpret and use warranty information in their assessments of product quality, regardless of firm reputation (as long as it is certain that even the firm with low reputation will meet its warranty obligations). We label this the "anchoring hypothesis." These two contrasting outcomes are represented in the following hypotheses:

**H1:** For experts, the effect of warranty on quality evaluations depends on firm reputation while for novices the effect of warranty on quality evaluations is independent of firm reputation.

(A) Experts will perceive quality to be higher with a good warranty relative to a poor warranty when the firm's reputation is high but not when it is low.

(B) Tenderfoots will perceive quality to be higher with a good warranty relative to a poor warranty irrespective of firm reputation.

**H2:** For experts, the effect of warranty on quality evaluations is independent of firm reputation while for tenderfoot the effect of warranty on quality evaluations depends on firm reputation.

(A) Experts will perceive quality to be higher with a superior warranty relative to a deprived warranty irrespective of firm reputation.

(B) Tenderfoot will perceive quality to be higher with a superior warranty relative to a deprived warranty when the firm's reputation is high but not when it is low.

#### 6. Experimental Analysis

Eighty-six undergraduate students participated in the hypothetical purchase scenario were asked to evaluate a new DVD with Home theater sound system model revealed in the context. The design was a 2 (firm reputation: high and low) X 2 (warranty: deprived and superior) X 2 (prior knowledge: experts and tenderfoot) between-subjects factorial where firm reputation and warranty were manipulated and prior knowledge was measured. Information was provided in two parts; the first part contained the reputation manipulation, and the second part contained the warranty manipulation. After reading the scenario, subjects evaluated the quality of the product, responded to a series of manipulation checks, and provided self-reports of knowledge and

purchase experience with this new product in the context.

### 6.1 Reputation manipulation

Reputation was manipulated using a procedure similar to that of [2]. Subjects were informed that a manufacturer of home audio-video components for ten years was planning to introduce a new DVD inbuilt home theater model. In the high reputation condition, subjects were told that previous models manufactured by the firm had been rated 'well above average' to 'average' by Consumer Reports and in low reputation condition, subject were told that previous models manufactured by the firm had been rated well below average to average by consumer reports.

### 6.2 Warranty operation

Warranty information was manipulated by varying the length and scope of the coverage. In the superior warranty condition, the product was featured as having a manufacturer's two year unlimited warranty covering all parts and labor and for deprived warranty condition, the product was featured as having a manufacturer's six month limited warranty which covered parts but not labor.

### 6.3 Prior knowledge measure

As described in the section 6.5, the prior knowledge measure was a combination of purchase experience and subjective knowledge [10].

### 6.4 Performance measure

Perceived quality was measured using an average of six, seven-point items. These were: (1) overall impression of the receiver (bad/good); (2) perceived quality (very low/very high); (3) quality compared to other receivers (lower than average/higher than average); (4) quality relative to other receivers (inferior/superior); (5) likelihood that the receiver would be durable (very unlikely/very likely); (6) probability that the receiver would be dependable (very low/very high). The six items loaded on a single factor and alpha for this measure was 0.89

### 6.5 Prior knowledge

Subjective knowledge was measured from responses on a seven-point scale (extremely unfamiliar/extremely familiar). The median score was 3. Subjects whose scores were on the high end of the scale and who had purchased a product were classified as experts and in vise versa subjects whose scores were on the low end of the scale and who had not purchased a product were classified as tenderfoot. Based on this

scheme, 39 subjects were classified as experts, 42 as tenderfoot and 5 subjects could not be classified.

### 6.6 Manipulation checks

The reputation manipulations assessed by averaging the ratings of the firm on two seven-point items (unrepeatable / reputable, untrustworthy / trustworthy). The 2 X 2 X 2 ANOVA results indicated that subjects in the high reputation condition rated the firm to be significantly more reputable than subjects in the low reputation condition (Means = 4.02 versus 2.44;  $F(1, 73) = 30.48, p < 0.01, \omega^2 = 0.26$ ). The warranty manipulation assessed by averaging the ratings of the warranty on two seven-point scales (bad/good, not comprehensive/comprehensive). The analysis showed that the mean warranty ratings were significantly higher in the superior warranty condition relative to the deprived warranty condition (Means = 5.47 versus 1.53;  $F(1, 73) = 166.38, p < 0.01, \omega^2 = 0.67$ ). The 2 X 2 X 2 ANOVA showed that the two manipulations did not affect other measures.

**Table 1: ANOVA Results**  
Means

a	High Reputation	4.02	$F(1, 73) = 30.48$
	Low Reputation	2.44	
b	Superior Warranty	5.47	$F(1, 73) = 166.38$
	Deprived Warranty	1.53	

Note: Higher  $p < 0.01$  for 'a' and 'b'

## 7. Results and Analysis

The two competing predictions were tested as a series of protected planned contrasts. The results in Table 2 showed that for experts, the interaction between warranty and reputation was not significant ( $F(1, 35) = 1.45, ns$ ). This finding provides support for the anchoring hypothesis and not for the contingency hypothesis. The planned contrast indicated that experts perceived higher quality with a superior warranty, regardless of firm reputation. When the firm's reputation was high, experts' quality ratings were significantly higher in the superior warranty condition relative to the deprived warranty condition (Means = 4.28 versus 3.02;  $F(1, 73) = 15.12, p < 0.01, \omega^2 = 0.37$ ). The same pattern was observed when the reputation was low (Means = 2.71 versus 1.93;  $F(1, 73) = 3.06, p < 0.08, \omega^2 = 0.22$ ). In contrast, for tenderfoot, the interaction between reputation and

warranty was significant ( $F(1, 38) = 8.44, p < 0.01$ ). The contrasts showed that tenderfoots perceived quality to be higher in the superior warranty condition relative to the deprived warranty condition when the reputation was high (Means = 4.27 versus 3.26;  $F(1, 73) = 10.55, p < 0.01, \omega^2 = 0.37$ ) but not when the firm's reputation was low (Means = 2.30 versus 2.54;  $F(1, 73) = 0.58, ns$ ). The data thus provide strong support for the anchoring hypothesis (H2).

A reanalysis of the present data disregarding the expert-tenderfoot classification allows a direct comparison of these results with [2] findings. A 2 X 2 (firm reputation, warranty) ANOVA showed that reputation, warranty, as well as the interaction had a significant effect on quality ratings. (The effect size clearly suggests that firm reputation was the more salient cue). The contrasts show that subjects perceived quality to be higher with a better warranty only when the reputation was high (Means = 4.27 versus 3.14;  $F(1, 73) = 23.47, p < 0.01, \omega^2 = 0.33$ ) but not when the reputation was low (Means = 2.45 versus 2.24;  $F(1, 73) = 0.87, ns$ ). These results are consistent with Boulding and Kirmani's [2] findings.

**Table 2: Experimental results – mean quality ratings**

Reputation	Deprived Warranty			Superior warranty								
	Tenderfoot			Experts								
	n	$\mu$	$\sigma$	n	$\mu$	$\sigma$						
Low	12	2.54	0.59	12	1.93	0.64	8	2.30	0.84	10	2.71	0.65
High	9	3.26	0.67	9	3.02	0.83	13	4.27	0.67	8	4.28	0.89

Note: Higher number denotes higher quality. The notation n,  $\mu$ ,  $\sigma$  denotes cell size, mean and std. deviation respectively.

### 7.1. Discussion

The experimental analysis clearly demonstrates that prior knowledge systematically influences the use of warranties as signals of quality. The results suggest that experts are able to evaluate and use the warranty cue independently of the more salient cue. Tenderfoot, in contrast, seems to utilize the warranty cue only when the more salient cue was positive. When the firm's reputation was low, tenderfoot seem to discredit the warranty information. Our results also suggest that ignoring the expert-tenderfoot dichotomy masks the differential effects of prior knowledge on how consumers use warranty as a signal of quality.

However, some limitations of Experiment preclude us from drawing definite conclusions. First, the warranty levels used (6 months and 2 years) were extreme relative to those in the marketplace. Given that subjects evaluated just one product (between-subjects

design), the effect of warranty may have been elevated for experts because of its typicality. Tenderfoots, on the other hand, who are less likely to be aware of the warranties in the marketplace, may not have been affected. However, when tenderfoots are provided a basis on which to make evaluations, the effect of warranty may be different. Note that we have assumed here that product knowledge is highly correlated with warranty knowledge. Second, experts are likely to be more knowledgeable about the warranty-quality association in the marketplace. Thus, experts may have been more inclined to use warranty as a signal of quality because the warranty-quality association is positive for the reviewed product. Third, the prior knowledge measure was a combination of purchase experience and sub-subjective knowledge [6], [7].

## 8. Conclusions and Future Scope

Customer dissatisfaction can arise due to poor performance of the purchased item and/or the quality of warranty service provided by the manufacturer. In either case, it results in a negative impact on the overall business performance. This could be either due to the dissatisfied customers switching to a competitor or losing potential new customers due to negative word-of-mouth effect. The consequence of deprived warranty servicing is more difficult and costly to rectify and hence it is very important that manufacturer avoids this occurring in the first instance. This analysis demonstrates the role of prior knowledge in consumer's utilization of the warranty signal in evaluating product quality and thus serves to identify some of the conditions in which consumers use warranties as signals of quality. The results from the experiment suggest that experts use warranty information in their quality assessments regardless of the reputation of the firm (provided it is certain that the firm with low reputation will meet its warranty obligations), while tenderfoot perceive higher quality with better warranties only when the firm is reputable. The studies indicate that the introduction of prior knowledge into the conceptual framework provides additional insights on consumer's utilization of warranties as signals that are not readily apparent from an aggregate analysis of the data. Our findings clearly suggest that experts and tenderfoot rely on different extrinsic cues and weight them differently in their quality judgments, particularly in the presence of multiple cues. The limitations mentioned in section 7.1 can be taken for study and the same can be overcome in the future work.

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