

HUMAN FACTORS IN PRODUCT RECALL PLANNING

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When a potential product defect has been identified by a manufacturer, much of the planning for a successful product recall can benefit from consideration of human factors. By viewing a product recall as an example of a safety information campaign, planners can apply lessons learned from the broad technical literature on the design and effectiveness of safety efforts. This paper provides an overview of a research-based approach to conducting and evaluating product recalls.

1. INTRODUCTION

A product recall is a corrective action in response to a potential product defect, and can involve providing post-sale information to product users, modifying the products in use, or retrieving the products. For the past century, beginning with a recall of the 1903 Model K Packard (Anon., 1979), recalls have been conducted for a wide and increasing range of products, from pharmaceuticals to consumer products to motor vehicles; they may be required by courts, mandated by government agencies, or undertaken voluntarily by manufacturers. Guidelines for planning, conducting or evaluating recalls are provided by agencies such as the Food and Drug Administration, the Consumer Product Safety Commission (CPSC, 1988), or the National Highway Traffic Safety Administration, as well as by numerous authors (e.g., Warner, 1977; Zagoria, 1982; McGuire, 1986; Jackson and Morgan, 1988).

The success of recall campaigns, with respect to the portion of relevant products that are retrieved, varies widely and is often disappointing. A review by the CPSC (1978) found that 72% of major appliances sought by recalls were retrieved or corrected, but only 3% of string trimmers were recovered in a recall for possibly defective wiring (Anon., 1988), and only 13% of potentially defective coffee makers were retrieved despite an extensive multi-media campaign (Warner, 1980). Consumer awareness of the recall is not sufficient; people who become aware via direct notification or other means give a variety of reasons for failing to comply with a recall campaign (Heisler and Bernstein, 1980; Smith, 1985)

It is not widely appreciated that crucial aspects of product recall efforts depend on human factors. Indeed, even the process that precedes a corrective action – deciding whether or not there is a product defect – often involves a human factors analysis. Mishaps, accidents, or injuries associated with a product may reflect more about how a product is used or misused than about characteristics of the product itself (e.g., Piziali et al., 1993; Rodgers, 1993; Ayres et al., 1998). This is particularly true when a product recall is under consideration for a class of products with purported generic design defects, as opposed to a specific model with suspected manufacturing or material defects; thus, before concluding that nonmotorized scooters as a class are defective because of a rise in reported injuries, one should consider the extent of usage of these products by the population, and determine whether the injury rate is dramatically higher than for comparable recreational products (see, for example, Wood et al, 1993).

Once the decision is made to conduct a product recall, and the specific models or items to be recalled are determined, the remainder of the process is closely tied to human factors. The steps taken in a product recall can vary depending on the circumstances and the remedy selected. In order to simplify the discussion here, we will focus on a typical hypothetical product recall involving an effort to retrieve products (to replace or modify) that are in the hands of users (as opposed to in warehouses or on store shelves). In such a recall, there are 3 main phases of planning with respect to information:

- Prepare a plan for delivering information to the target audience
- Determine the information that needs to be delivered
- Develop the information presentation

The difficulty of the first step depends on manufacturer records. If all (or most) owners of a product can be identified individually, the delivery plan may be simple in principle, such as sending certified-mail letters; this is often the case with recalls of automobiles or large industrial equipment. Otherwise, it can be more difficult to reach a target audience. Notices may be placed in relevant trade or enthusiast magazines, or posted in appropriate retail outlets. Often a public relations firm can help with this process. The ability to reach product owners directly (i.e., by phone or personal mail) is crucial for the success of recall campaigns, as demonstrated by studies of recalls involving pharmaceuticals (Soviero, 1978) and consumer products (CPSC, 1978; Murphy and Rubin, 1988); the CPSC review concluded that 9 out of 10 recall campaigns conducted with little or no direct consumer notification are less than 20% effective.

The remaining steps – determining the information to deliver, and developing the information presentation – will be discussed more fully below. The key to this discussion will be a safety-information perspective. We propose that product recalls be considered as a subclass of safety information campaigns, similar to the use of cautionary signs and warning labels. Lessons learned from research on safety information campaigns will be applied to product recalls.

2. MECHANICS OF PRODUCT RECALL CAMPAIGNS

The second step concerns the mechanics of the recall – what specific products need to be retrieved? What numbers or other details will help owners identify the relevant models? What is the nature of the problem that has prompted the recall? What should they do with the product? Do they need to take it in for repairs (e.g., taking a car to a dealer), mail it in for replacement, or send for a modification kit that they will have to install?

Research on attempts to change safety-related behavior through caution signs or warning labels has found that one of the most important factors is the cost of compliance. For example, a sign indicating that a door was broken and could cause injury had virtually no effect on the behavior of people coming to use the doorway unless an alternate door was only several feet away (Wogalter et al., 1989). Signs about the ocular hazards of racquetball increased use of goggles only when goggles were available immediately adjacent to the courts, and warnings on spray-cleaner bottles increased the use of protective gloves only when gloves were provided with the bottles (Dingus et al., 1993). Not surprisingly, cost of compliance plays an important role in the success of product recall campaigns as well: a review of consumer product recalls between 1978 and 1983 found significantly greater compliance when in-home repair was offered (Murphy and Rubin, 1988). Similarly, many of the people who did not return a recalled coffee maker said they were unwilling to give up their only coffee maker (Malickson, 1982).

Compliance with a product recall usually will entail some cost on the part of the product owner, such as the time and effort to check the product model number to see if it is in the recalled set, the effort to contact the manufacturer and perhaps send the product by mail, and the temporary or permanent loss of the product. In order to overcome such costs, incentives frequently are offered. Unfortunately, it is often impractical to fully compensate owners for their perceived cost of compliance. A manufacturer might feel generous in offering a 50% rebate on the purchase of a new coffee pot in exchange for the return of one that is several years old or more, but a consumer may feel that is insufficient for the effort involved and the loss of their old pot which apparently worked well.

3. DEVELOPMENT OF INFORMATION PRESENTATIONS

Given a plan for the recall process, the next important phase is to design the notice or information presentation that is going to be distributed to actual or potential owners of the product of interest. Elsewhere we have described the typical steps in developing a product warning label (Ayres and Wood, 1995). Here we describe a very similar process that we follow when designing recall notices. The process to be discussed has been abstracted from numerous projects, and is not meant to be an exact prescription; specific situations may not call for all steps, and external constraints may allow or require changes in the order or nature of the work. There is some overlap between these steps and other phases of product recall planning.

3.1 Review standards and regulations

Manufacturers preparing a product recall need to be conversant with any regulations or requirements that apply to their situation. Normally when a recall has been mandated by a government agency (or is being performed in voluntary cooperation with a government agency), the agency involved provides guidance on the requirements. In the absence of regulations, the manufacturer should consider published guidelines for what is considered reasonable and appropriate, such as the suggested principle of reverse marketing (trying to recover a product through the same notification and distribution process that was used to sell it).

3.2 Analyze accident and complaint data

As noted earlier, a careful review of accidents, claims, complaints, and other information about problems associated with the product can help a manufacturer understand why problems arise and what remedies are most likely to be effective. Publicly-available accident data are generally a more reliable basis for understanding than consumer complaints (McCarthy, 1979); in other cases, reportedly defective or failed products returned by consumers may provide the best basis for studying the failure mode.

3.3 Consider behavioral effectiveness factors

Empirical research on the effectiveness can contribute to a rational design process for safety information (McCarthy et al., 1995). Considerable research has been conducted on the effectiveness of warning labels and other safety information presentations, and extensive review are available (Laughery and Wogalter, 1997; Ayres, Wood, Schmidt, Young and Murray, 1998; Rogers et al., 2000). In real-world application (as opposed to laboratory tests), it turns out to be difficult to influence safety-related behavior through admonitory signs and labels. Nevertheless, the extant research is of value for

indicating several factors that play important roles in safety information effectiveness, as well as other factors that do not. Cost of compliance is highly influential, as discussed earlier.

A second important factor, when present, is the immediate cost of non-compliance; the most obvious form is external enforcement. Public safety campaigns urging the use of seat belts or motorcycle helmets were largely ineffective until mandatory usage laws were enacted and enforced (Robertson, 1976; Phillips, 1983). Another immediate cost of non-compliance would be a high likelihood of some kind of loss if the proposed behavior is not adopted; in this connection, out-of-order signs tend to have high compliance rates (Wogalter et al., 1987), as do credible notices of temporary hazards such as wet, slippery floors (Wogalter and Young, 1991). Conversely, unenforced seatbelt laws or on-product warning labels addressing unlikely accident modes are unlikely to affect behavior (Campbell, 1987; Arndt et al., 1998).

Research has also identified factors that seem to have little or no influence on the effectiveness of safety information. The specific wording or format of notices or labels does not appear to be important; neither the choice of signal word (e.g., *danger*, *warning*, or *caution*) nor the choice of color is found to have a consistent effect as long as the message is reasonably salient and comprehensible (Frantz, 1993). The depicted severity of consequences – e.g., how badly a person might be injured if an accident occurs – generally does not influence effectiveness, even though it affects risk judgments of laboratory subjects (Ayres, Wood, Schmidt and McCarthy, 1998).

These findings indicate some of the reasons that product recall campaigns can have disappointing results. There is usually no way for manufacturers to influence the immediate cost of non-compliance through enforcement (and government agencies are reluctant to impose bans on products that are in use; e.g., Rodgers, 1991); in addition, since the accident rate is generally rather low for most recalled products (e.g., most electric coffeemakers sought in a recall will not immediately cause fires if owners continue to use them), the immediate costs of non-compliance tend to be too low to overcome the costs of compliance. Manufacturers can control the depicted severity of accident consequences, but this is relatively unimportant for safety information effectiveness; one study found that people who responded to automotive recall notices were no more likely to judge the defects as serious than were non-responders (Heisler and Bernstein, 1980). Exaggeration of severity or likelihood runs the risk of lowering the credibility of the notice and diminishing its potential effectiveness.

3.4 Generate candidate messages

Based on a consideration of the target audience (likely product owners or users) as well as the results of the preceding steps, a draft of the recall notice can be prepared. Several versions of key portions can be generated, in order to explore trade-offs such as brevity vs. thoroughness, or explicitness vs. acceptability. In general, a shorter notice is more likely to be read, but a longer notice allows more detailed specification of the problem, the product involved, and the steps to take. An explicit description of possible consequences may convey a clearer notion of the problem, but graphic or descriptive portrayal may disturb recipients more than necessary.

3.5 Perform developmental research

In order to ensure that the notice is likely to be understood by most members of the target audience who read it, testing can be conducted with subjects selected from the target audience; for example, a recall notice for automotive tools might be tested with adults who perform some home automotive repairs. Groups of 10-15 subjects are small enough to permit exploratory discussions but large enough to get some indication of likely population tendencies. One goal is to be able to select brief messages that nevertheless convey sufficient information to the subjects; another is to gauge subject preferences for explicitness. In addition, this testing provides an opportunity to explore likely reactions to the costs of compliance for the product recall and to proposed incentives to overcome those costs. Often it is helpful to perform several rounds of testing, with successive refinement of the notice elements between tests.

3.6 Conduct confirmatory test

Usually several rounds of testing will be sufficient to lead to a good design for the recall notice. In some cases, however, the manufacturer may want added assurance and documentation that the notice has been reasonably well optimized. For this purpose, it is appropriate to test comprehension and reactions with the proposed final version, using a larger group of subjects than in the developmental research.

3.7 Finalize notice

Based on the documented results of the preceding steps, a final version of the recall notice can be recommended. Documentation of the information presentation process, including any test results, provides a basis for later evaluation of the product recall effort.

4. EVALUATION OF PRODUCT RECALL EFFORTS

As with all safety information campaigns, there are two primary goals for product recall efforts: inform people about problems, and induce people to take action (repairing, returning, or replacing a product). A variety of factors can stand in the way of the desired behavior changes. A manufacturer can work to identify likely product owners and to provide reasonable incentives for compliance, but high costs of compliance and low immediate costs of non-compliance are generally outside the manufacturer's control. Therefore, a simple scorecard – what percentage of product units were retrieved as a result of a recall effort – is not an appropriate basis for evaluation. We propose three heuristics for judging a product recall campaign: communication, state of the art effort, and comparative success.

4.1 Communication

If a large portion of product owners become aware of a recall, and if they have an understanding that there is some risk associated with the product, then the recall has achieved a crucial goal, even if most owners choose not to replace or return the product.

4.2 State of the art effort

Product recall activities, such as the means used to locate owners, deliver notices, and track responses, have changed over the years. Just as safety information presentations produced at a given time are best judged in the context of the contemporaneous state of relevant practice and knowledge (CITATION – Warning Labels and the state of the art...), product recall campaigns should be considered in light of typical current approaches.

4.3 Comparative success

Given an understanding of the fixed or exogenous factors that determine the likely recovery rate of a product recall campaign, it should be possible to ascertain whether a given campaign did as well as expected (or better, or worse). Warner (1980) found that a coffee maker recall had a 13% recovery rate (for units owned by consumers, as opposed to those held by dealers or elsewhere in distribution); this apparently low rate compared favorably with the 7% predicted from the recall effectiveness model developed by the CPSC (1978). Empirical models need to be developed or extended with the results of more recent product recalls; in the meantime, comparison of recovery rates across recall campaigns for reasonably similar products or components can provide some guide for judging effectiveness.

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