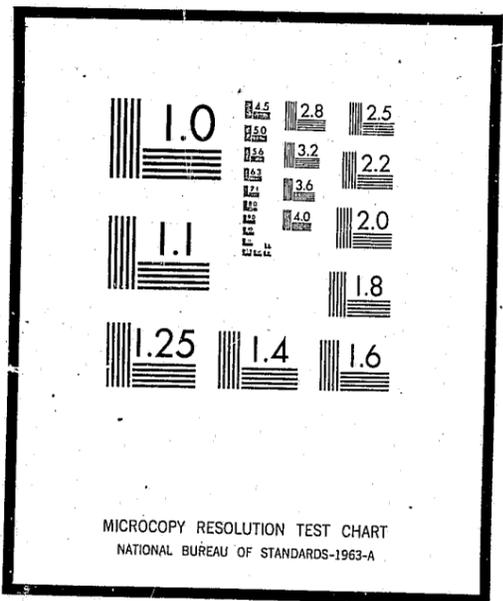


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Law, Technology and the Expert¹

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A product is safe to the extent that it is not judged defective and unreasonably dangerous in litigation. Both product safety and product liability prevention, then, have meaning only relative to the legal determination of product liability. The technologist, either as an expert in product design or as a litigation witness, must, therefore, view his responsibilities from the perspective of the legal meaning of an unsafe product in order to fulfill his role appropriately.

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²Numbers in parentheses designate References at end of paper.

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INTRODUCTION

Product safety, product liability, and product-liability prevention. These phrases resound from every corner of our society. Product safety is the banner of the consumer advocate, the Consumer Product Safety Commission, and the Occupational Safety and Health Administration. In litigation, product liability is the pivotal phrase, while the beleaguered manufacturer seeks the key to product liability prevention. Despite whatever inherent meaning may be ascribed to these phrases by any segment of society, they are subject to no universal interpretation. In the strictest sense, a product is safe only to the extent that it does not give rise to liability; liability can be prevented only by recognizing in what ways the product may give rise to liability.

The suggestion here is that both product safety and product liability prevention have meaning only relative to the legal determination of product liability. On the basis of this premise, we shall explore the postures of the technologist as the developer of the philosophy of product design and as a participant in the legal evaluation of product design, both as an expert witness in product litigations and as a consultant who formulates institutional standards.

THE LAW

Since 1916, negligence has been the pervasive premise for establishing liability on the part of the manufacturer within the legal system. For plaintiff to establish a prima facie case of manufacturer liability, it was necessary to establish that the manufacturer's conduct was, in some way, substandard: a failure to inspect, a deliberate use of substandard material, or an imperfect assembly process. As a basic requirement for establishing liability, plaintiff not only had to establish the existence of a flaw in the production of a product, but also had to demonstrate that techniques were available at the time of manufacture that the manufacturer should and could

have used to discover the flaw. If negligent design was predicated, then one had to establish the existence of a feasible technology, at the time of manufacture, which would have permitted safer design. The ground on which the battle of negligence is fought is that of manufacturer foreseeability coupled with the state of technology existing at the time of manufacture.

In the mid-1960's, the battleground shifted from a focal point of manufacturer's fault to one of fundamental product inadequacy. The new law of strict liability (adopted judicially in the majority of states) states explicitly: (2)

1 One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if

- a The seller is engaged in the business of selling such a product, and
- b It is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.

2 The rule stated in subsection 1 applies although:

- a The seller has exercised all possible care in the preparation and sale of his product, and
- b The user or consumer has not bought the product from or entered into any contractual relation with the seller.

It is apparent from subsection 2a that since liability may be imposed even though the seller (or manufacturer) has exercised all possible care in the preparation of the product, the manufacturer's fault or absence has no bearing on the question of liability. The law has interpreted "preparation" to cover defects arising from both the design and the production of products.

If the manufacturer's fault is not to be a test of liability in an action in strict liability, then it can only be the product itself within the environment of use that becomes the subject of the liability test. But how can an inanimate object, a product, be "in a defective condition unreasonably dangerous to the user?" One can say that in the broadest sense the product may have an unreasonably dangerous defect if it causes harm as a consequence of failing to meet the reasonable expectations of consumer use. Rather than testing the efficacy of a product against a manufacturer's quality control procedures or state of the art technology, strict liability requires that the product be tested against consumer-focused standards of performance. However difficult it may be to focus upon the adequacy of quality control procedures and appropriate technology, it is considerably more difficult to articulate, with any precision, reasonable standards of product performance. Yet these standards are the only appropriate focus for establishing defectiveness and potential liability. Since both product safety from the consumer's viewpoint and liability prevention from the manufacturer's perspective are referenced to the legal meaning of product liability, standards of product performance must become the pivotal consideration.

TECHNOLOGY: STANDARDS OF PERFORMANCE

There would be little difficulty in appreciating the meaning of the term "standards of performance" if the only perspective were that of quantitative design parameters. For example, selection of the appropriate stress level for a part to insure reasonable fatigue life could be considered a performance standard. The selection of one material over another to meet a given design consideration also implies a certain desired standard of performance. There is no need to dwell on other examples to illustrate what may be termed quantitative standards of performance. In fact, "standards of performance" may be the appropriate term to describe the basic quantitative design of any product. Indeed in an action against the manufacturer brought upon a theory of negligent manufacture or design, it is the manufacturer's or the industry's standards of performance that are under attack.

But the "standards of performance" through which an unreasonably dangerous defect is to be established under strict liability rest on a series of questions broader than those arising from the designer's quantitative standards. One particularly appropriate view of the questions

raised in addressing these broader standards has been set forth by Dean Wade: (3)

- 1 The usefulness and desirability of the product
- 2 The availability of other and safer products to meet the same need
- 3 The likelihood of injury and its probable seriousness
- 4 The obviousness of the danger
- 5 Common knowledge and normal public expectation of the danger (particularly for established products)
- 6 The avoidability of injury by care in use of the product (including the effect of instructions or warnings)
- 7 The ability to eliminate the danger without seriously impairing the usefulness of the product or making it unduly expensive.

There is no question that our terming the Wade indicia "standards of performance" is disconcerting. The subjective judgments to be elicited in each of these seven indicia hardly seem appropriate as explicit measures of a product's performance. And even to the extent they appear appropriate, they seem to be outside the purview of the technologist, be he designer or expert witness. Yet, we submit that within the true meaning of strict liability, it is the jury's weighing of these seven elements, whether explicitly stated or not, that will lead to the conclusion of a defective and unreasonably dangerous product, to establish "product liability." We submit, therefore, that as difficult to quantify as the Wade indicia may be, they must form the basis of a responsive design philosophy from the perspective of both product safety and product liability prevention. Consequently, they must also be considered by an expert witness in reaching his conclusion for the court's and jury's considerations.

An alternative view of these standards of performance is to consider them as essential elements of risk-utility theory. Trade-offs are an inherent feature of every product's design, manufacture, and marketing. From the manufacturer's point of view, such considerations as material selection, alternative features, lifetime of product, safety aspects, appearance, potential market, production costs and profit, and intended use are inextricably intertwined in management's risk-utility decision to manufacture and market a product as is or to redesign it.

The considerations by the consumer of the

elements of a risk-utility theory are, by no means, as extensive or pervasive as the manufacturer's analysis, but they are no less important. His considerations are a subjective amalgam of his need or a desire for a product, its appearance, cost, lifetime and safety features, as well as how he expects to use it.

As inadequate as the consumer's risk-utility approach may be, it is his decision elements rather than the manufacturer's which are reflected in the Wade indicia and will form the basis for the jury's determination of product liability. There do not exist any fixed guidelines which indicate how the decision of product defectiveness or non-defectiveness emerges from the amalgam of the Wade indicia. Yet, reasoned decisions do emerge from the application of this risk-utility theory.

The Consumer Product Safety Commission has recently ordered a certain very effective glue removed from the market. The reason implied by the Commission for its order was that the extreme care required in its use offset its unquestioned utility. The apparent difficulty with the product that precipitated the Commission's action was the proclivity for rapid and nearly permanent adhesion of inappropriate surfaces, such as fingers, clothing, and eyelids. In the broadest sense, the apparent risk in using this product exceeded its unquestioned utility.

If we examine the Wade indicia within the context of this example, one can deduce the reasoning which would lead to the decision to take the product off the market. Apart from any consideration of risk, the usefulness and desirability of the glue is unquestioned. Nonetheless, there are other adhesives on the market, which, while perhaps not evidencing the same adhesive capability and speed, can fill the same need without the same level of risk of attaching inappropriate surfaces. One can argue that even the presence of a very prominent and well-phrased warning on the product would not elicit the desired realization on the part of a consumer of either the likelihood, severity, or obviousness of the risk. Since the typical user is not usually alert to rapid technological changes, his responses are generally framed on the basis of past experience, within which the new risk is not apparent. It is unlikely that a warning, by itself, will effect a change in the user's behavioral pattern, a pattern which has been based upon past experience with similar products. It may be assumed that the Consumer Product Safety Commission believed common knowledge would either not rise to a level where the public would be alerted to the risk, or that during the time lag neces-

sary to bring public knowledge to a sufficiently high level there would have resulted an unreasonably large number of injuries. And finally, it is apparent that the utility of this product resides in its outstanding adhesive property, and that any attempt to mitigate this capability would remove the only feature which distinguishes it from the other products meeting the same need.

We have offered arguments for the performance standards indicia to support the Consumer Product Safety Commission's order to remove the substance from the market. We submit, however, that if the product were subject to litigation by a party injured by this product, the defendant-manufacturer could offer arguments based on these same indicia to support his contention that the utility far exceeded the risk in using the product. For example, the manufacturer might urge that this product's capability of attaching such a wide variety of materials is not matched by any other product on the market. He might further advance the argument that his design of the container and spout would minimize, if not eliminate, the danger of the adhesive coming into contact with inappropriate surfaces.

We are suggesting that, if plaintiff and defendant offer arguments in support of their perception of the risk-utility theory (or standards of performance) as suggested by the Wade indicia, the issue of the defective product and the determination of liability will be based on the only premise that is consistent with the intrinsic meaning of strict liability.

To further illustrate the central issues which should be raised through application of risk-utility premises, consider the case of a plaintiff injured when his automobile unexpectedly careened off a narrow, dark and winding mountain road, late at night. It was alleged that the accident was caused by plaintiff's inability to see the road when the control circuitry for the headlight covers failed, causing the covers to close over the lighted headlights resulting in the loss of illumination of the road ahead. Assuming the validity of the asserted cause of the accident, the plaintiff might offer a persuasive argument for the defectiveness of the design of the headlight covers, based upon risk-utility considerations. He could suggest that there is an inherent lack of utility in this product, and that its desirability is solely the cosmetic appearance of the car. If one can demonstrate to a jury's satisfaction that a product feature has an inherently low usefulness, then a justification for its use must be found only when an even lower risk of danger flows from its

use. Or to state this another way, the lower a product's utility, the greater must be its intrinsic safety. Thus, in this situation, because of the reasonable probability of failure of any of a number of components in the headlight cover control circuitry, any one of which could result in inadvertent closing, the greater is the need for either a fail-safe or a backup system design. Finally, if the cost of eliminating the danger through such means would result in a prohibitively expensive system, then this might argue for the elimination of a feature with minimal utility.

THE EXPERT: DESIGN AND LITIGATION

Despite whatever validity the risk-utility theory may have in adjudicating the issue of product liability in a court of law, should the technologist, be he product designer or an expert witness in litigation, concern himself with the broad societal questions evoked in addressing questions of the standards of product performance? And even if there is validity to his consideration of these broad concerns, is he equipped by training or experience to give thoughtful and meaningful responses? We suggest that not only are the answers "yes" to both questions, but that the only appropriate discipline to evoke these considerations is that of the technologist.

Quite simply, since the technologist is, in the first instance, responsible for the design of all of a product's features, and since in litigation he is asked to offer conclusions on the efficacy of an injury-producing product, in retrospect, he cannot ignore the societal questions upon which ultimate judgment will be made. In litigation, the technologist, by developing his conclusions through his perception of the risk-utility elements of a given problem, provides a framework for the multiple questions which the jury must ultimately resolve. Whether the jury accepts or rejects the framework of the expert's judgment, either in whole or in part, is not critical to the validity of the expert providing this comprehensive view of the product. But we submit that the expert's conclusions have little validity, and should be entitled to minimal consideration by the jury if these conclusions have not been reached through the searching issues raised by questions of standards of performance.

The very antithesis of this broad role we are suggesting as appropriate for the expert in litigation is that of the evidentiary gap-filler, which all too often appears to be his present role. The expert, as a gap-filler, is viewed by counsel as the person whose principal function is

to describe what alteration in the product would have prevented the specific accident involved in the litigation. This consideration should obviously be a part of the expert's investigation, but it is our basic premise that an expert who is called solely for the purpose of testifying that a proposed design alternative would have prevented an accident (or, conversely, that there is no inherent risk in the use of the product) is not fulfilling the critical role of the expert. As we have suggested, the expert is to provide the trier of fact with the principal evidentiary elements necessary to reach the legal conclusion of defect. Such elements must necessarily include the considerations of risk and utility as well as the description of the design modification. Among all the possible witnesses, we suggest that it is only the appropriate technological experts who can speak to these broad questions that must be answered to establish the conclusion of unreasonably dangerous defect.

To be somewhat more precise, the consideration of an alleged design defect would require that the experts address themselves to the following issues:

- 1 The identification of the design flaw or flaws which occasioned the injury
- 2 The delineation of such alternative design features as would mitigate or eliminate the risk of the injury
- 3 The evaluation of such alternative design features relative to the expected performance standards of the product, as well as:
 - a Their effect upon the subsequent usefulness of the product
 - b Their effect upon the subsequent cost of the product
- 4 The comparison of this product with other similar products
- 5 The causal link between the alleged design deficiency and the injury.

Similarly, if a production defect is alleged, the following elements must be adduced by the experts:

- 1 The identification of the flaw or flaws relative to manufacturing or physical property standards
- 2 The evidence that the failure or malfunction of the product is directly attributable to the flaws
- 3 The relationship of the failure or malfunction to the expected performance standards of the product

4 The causal link between the failure or malfunction and the injury.

There are other significant aspects of both the role and the qualifications of the technical expert in litigation.⁽⁴⁾ There is, however, one element, the self-education of experts, that deserves mention here.

In very few instances will there be a precise matching of the expert's prior education and experience and the particular needs for expertise in a given situation. Consequently, it is to be expected that because of prior education and experience, the expert will be capable of and indeed will have undertaken sufficient self-education so that he is able to speak to the particular aspects of a given problem. The capacity for such self-education, of course, must be consistent with the prior education and experience of the expert.

There is no question that the present emphasis in qualifying the expert is almost exclusively directed toward an examination of paper credentials and relating those credentials to the specific product under examination. There is almost no attention given to the capacity of the witness to undertake self-education and the extent to which he has actually done so. Indeed, to the extent that an expert's self-education is introduced at all, it is used in a perverse manner. Self-education for a particular case becomes primarily a weapon for discrediting the expertise of the witness rather than a means for qualifying him. Should a potential witness admit that he has undertaken specific study for the purpose of testifying in specific litigation, he becomes fair prey for derisive cross-examination. Under such attack, the value of his self-education is dwarfed by his admitted lack of previous experience. We are at a loss to understand the enhanced credibility of a given amount of experience when that experience has been gathered at some period remote in time. In light of today's rapidly evolving technology, the inverse relationship of credible experience and time is contorted logic.

As a practical matter, the brunt of this phenomenon is borne by plaintiff's witness. It is common knowledge that there is no open market for experts with experience in specific products. They are, by and large, in the employ of institutional defendants, if they exist at all. Plaintiffs are thus forced to seek generalists, such as consulting engineers, academicians, and technicians in the private sector. Their only hope for qualification demands the very process of self-education for a particular litigation.

Given this state of affairs, it is self-defeating to insist on expert testimony for a plaintiff to make out a prima facie case while at the same time attacking the credibility of the witness through the only procedure by which he comes into being as a witness. There may be valid reasons to distinguish between seasoned experience and recently acquired understanding, but this question may also be legitimately raised as may be required by the scope of the technological issue. In short, we suggest that it is high time that the courts take cognizance of the real world of technological expertise and insist that the capability and realization of self-education be demonstrated. Once self-education has been recognized as a legitimate basis for expert qualification, the courts have a duty to prevent its being demeaned by reckless cross-examination.

Departure from the status quo in any system is difficult, and it is no less so in the legal system. Nonetheless, it is our belief that initiative for the desired changes in both the role and qualification of the expert can come from the technological community. If both the expert in design and the expert witness in litigation insist upon employing and enunciating risk-utility concepts in serving their respective roles, the systems may be encouraged to respond positively.

CONCLUSION

If it is reasonable to assume that the risk-utility criteria will form the basis for judging the interaction of technology and society in the courts, then we believe that these must be the same criteria to be used when products are designed and marketed and when standards or codes are devised for establishing guidelines of design and manufacture.

What is being suggested is a modified and expanded set of goals for product design and development. They are difficult to quantify and may require enlisting or developing new skills, but they must be undertaken, nevertheless. The government's response to society's demands are patently evident and the legal system has a new set of rules, in strict liability, that are still unfamiliar but place a significantly greater burden on the manufacturer. The reaction to these stimuli must be positive, incisive, and responsive to a new era of understanding our technology in the context of its actual environment and use.

It is suggested that the new directions for product design and development, rather than being stifled by governmental restrictions or judicial decisions will, in fact, be more chal-

lenging because of them. The problems are undeniably more difficult. The research and development efforts must, therefore, be more creative and imaginative.

Product design philosophy must recognize that the additional constraints of societal expectations and behavior should be a logical and intimate part of its activities. It must also assume a responsibility for educating the public and counseling the legal system as it seeks to understand the real interaction of society with technology.

The benefits will be twofold: not only will our products be better understood by the producer as well as the consumer but, as well they will be

better utilized. At the same time, both the governmental overseers and the legal system will benefit by the serious attempt by technology to understand and design for society's use of its wares. The guidelines will be brought into sharper focus, and strict liability will not degenerate into absolute liability.

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