

# Ratings checklist for warnings: a prototype tool to aid experts in the adequacy evaluation of proposed or existing warnings

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**Abstract.** In the field of forensic human factors, experts are often called upon to assess and evaluate the adequacy of new or existing products' warnings or warnings systems. The usual goal of this evaluation is to arrive at a simple binary decision regarding the warning in question (i.e., does it "pass/fail", or is it "adequate/inadequate"). However, such a warning assessment process may in fact be quite complex and multidimensional in its execution. The existing warnings research literature has identified a fairly large number of warnings features or factors likely to have an impact on a given warning's effectiveness or adequacy. The tool addressed in this article is intended for use by a warnings expert (as opposed to one less knowledgeable and informed about complex warnings issues), and can serve as a reminder checklist to help ensure that the expert has taken into consideration the most relevant features or factors during such a warnings adequacy assessment.

Keywords: Warnings, Warnings Evaluations, Warning Adequacy, Product Safety

## 1. Introduction

Within the discipline of forensic human factors, a considerable amount of attention is directed toward the topic areas of hazard warnings and/or warning systems. Principal activities in these areas include devising and configuring new warnings, evaluating and assessing existing warnings, testing the efficacy of proposed warnings (in terms of how well their meanings are understood, and their likelihood of impacting subsequent behavior), and generally judging the adequacy of a warning in meeting its overall objectives of alerting a user about a given hazard, identifying the consequences associated with that hazard, and advising the user as to how to avoid becoming a victim of that hazard.

It has been recommended, Laughery [22], that these types of warnings design, development, testing, and evaluation processes be carried out by "warnings experts". Briefly, a warnings expert is someone who (a) is familiar with the body of warnings research literature that has developed over the past three decades; (b) has some expertise in relevant methodologies such as hazard analysis, fault-tree and failure-modes analyses, task analysis, display design, and data collection and analysis; and (c) has a level of knowledge about human cognition – how people process information.

That body of warnings research literature is quite large, and is continually growing. And, the warnings adequacy evaluation process can be, and often is, quite complex and uniquely specific to each hazard analysis or product safety assessment situation en-

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countered. The various warnings features or factors that have been described and discussed in the literature may be more or less applicable in each such instance. And, the warnings expert must decide, on a case by case basis, which of these factors is most relevant.

In a recent article, Lenorovitz, Karnes, & Leonard [26], presented case study examples of how a warnings adequacy assessment process might be conducted, and which of a set of warnings evaluation features were judged to be most applicable within each case considered. Several reviewers of that article suggested that there might be some value in compiling a kind of warning expert's reminder checklist from that set of identified warnings adequacy characteristics. Such a checklist ought to be of use to warnings experts engaged in a given warnings adequacy assessment task – to help remind them of items that might be particularly relevant, and/or to help organize and justify their thinking about how or why they view a given warning as being adequate. That was the motivation for the current exercise, and the basis upon which the following prototype version of a checklist tool is offered.

## 2. Developing the checklist tool

It was decided that the tool would initially be configured as a matrix having 15 rows and 7 columns. Table 1 depicts this structure. Each of the “main” rows represents one of the 15 features that were originally identified in the Lenorovitz, et al. [26] paper. Subsequently, it was decided that the fourth row, “Conformity with Standards and Other Recommended Practices”, was overly-broad, and four additional “sub-rows” (“Color Coding”, Safety Alert Symbols”, “Signal Words”, and “Message”) were then added.

The seven column headings consist of the following: (a) a feature-identifying index or reference number, (b) the name or descriptive title of the feature (c) a brief definition or description of the feature, (d) one or more literature citations – i.e., references to source documents where further information can be found regarding that feature – and, the 5<sup>th</sup>, 6<sup>th</sup>, & 7<sup>th</sup> columns provide a place where a warnings expert can enter a ratings checkmark to indicate whether he/she judged that particular aspect of the subject warning to have been handled in a “deficient”, “adequate”, or “outstanding” manner.

Several additional points should be noted with respect to this table. The first is that the current au-

thors thought that this set of features represented a key grouping of some of the most salient features or factors in determining the adequacy of many different types of warnings. They did not conclude that these were the **only** factors worth considering. Nor, did they conclude that they were the most significant or most important factors in all warnings evaluation situations. Any warnings expert who elects to use this tool is encouraged to add or omit features/factors in order to adapt or tailor the checklist to the particular warning situation with which he/she is dealing..

Second, the authors selected this particular set of features because they thought that these features were well represented within the warnings literature, and that they had been cited, researched, described and discussed by numerous other warnings experts over a lengthy period of time. If you will, they thought that these features collectively represented a group of highly regarded, “consensus” picks – ones that most other warnings experts will at least recognize as ones with which they are already familiar and comfortable.

Third, the authors gave considerable thought to the source references they chose to list in column four. It would be easy to identify as many as 12 -20 plausible citations for each of these factors. While trying to adhere to some pretty severe (self-imposed) space limitations, the authors merely wanted to select a small set of representative references – again, ones with which most warnings experts were likely to be familiar, could fairly easily access, and from which they might be able to acquire additional, useful information.

Fourth, it is worth noting that this tool has been described as a “prototype”, or early-generation tool. It is anticipated that there will be numerous comments and suggestions about the benefits and deficiencies of the tool, and feedback from those who take the time to “try it out”, as to how to improve both its appearance and function. That is a very likely outcome – one that is expected, intended, and will be greatly appreciated. Our experience has been that warnings experts are typically not shy about expressing their opinions.

## 3. Using the checklist tool

As stated previously, this tool was developed with warnings experts in mind – i.e., foreseeing that such

Table 1  
 Prototype Ratings Checklist for Warnings Adequacy Evaluations

Index No.	Warning Feature or Factor	Feature Meaning / Description (General Synopses)	Source / Reference	Deficient	Adequate	Outstanding
1	Clarity / Comprehensibility	The extent to which the meaning of the message can be clearly understood or comprehended by the intended target audience – without reference to other sources.	Smith-Jackson [41]; Wogalter [43]; DeJoy [5]; Leonard [28]			
2	Completeness	The extent to which all relevant aspects of the message are contained therein – generally a tradeoff with “conciseness”.	Laughery [24]; Mazis [33]; Wogalter [44]			
3	Conciseness/ Brevity	The brevity, compactness, or efficiency of expression with which the message is composed – generally a tradeoff with “completeness”.	Laughery [24]; Young [50]; Leonard [28]; Mazis [33]			
4	Conformity with Standards / Other Recommended Practices	The extent to which the warning is in conformance with established standards or generally recommended practices regarding the form, configuration, and content of precautionary messages and/or safety instructions – applicable standards/practices may vary according to targeted user audience (country of usage, language, etc.)	ANSI Z535 (Series: Z535.1, Z535.2, Z535.3 ... Z535.6) [2]; ISO 3864 (Series: 3864-1, 3864-2, ... 3864-4) [19]; Peckham [35, 36]; Young [51]			
4.1	Color Coding	Conforming to established standards regarding the use of specific colors to reflect varying degrees of hazards/risks (e.g., yellow = “caution”, orange = “warning”, red = “danger”).	ANSI Z535.1, Safety Colors Standard [2]; Peckham [35]; Young [50]			
4.2	Safety Alert Symbols	Conforming to established standards regarding the use of specific symbols/shapes to reflect varying degrees of hazards/risks (e.g., the different forms of the triangle and embedded exclamation point symbols used to reflect: “caution”, “warning”, & “danger” level hazards).	ANSI Z535.3, Criteria for Safety Symbols [2]; Deppa [6]; Peckham [35]; Leonard [28]			
4.3	Signal Words	Conforming to established standards regarding the use of specific words to reflect increasing levels of hazards/risks (e.g., “CAUTION”, “WARNING”, “DANGER”).	ANSI Z535.4, Product Safety Signs and Labels [2]; Peckham [35]; Wogalter [46]; Hellier [18]; Leonard [28]			
4.4	Message	Conforming to established standards regarding the composition and wording of precautionary instructions relating to a specific hazard – normally including the three component parts of: hazard statement, consequence of the hazard, and method of avoiding the hazard.	ANSI Z535.4, Product Safety Signs and Labels [2]; Peckham [35]; Wogalter [46]; Leonard [28]			

Table 1 (Continued)  
 Prototype Ratings Checklist for Warnings Adequacy Evaluations

Index No.	Warning Feature or Factor	Feature Meaning / Description (General Synopsi)	Source / Reference	Deficient	Adequate	Outstanding
5	Consequence	The likely negative result – often some type of damage, injury, or other loss – of coming into contact with or being exposed to the identified hazard.	Laughery [24]; DeJoy [4]; Leonard [27]			
6	Consistency	When a “warning system” exists (i.e., when multiple, redundant presentations of the warning are provided in different locations, in different forms, and/or using different media in order to increase the likelihood that those in need of the warning will encounter, read, and attend to the message), the extent to which each instance of that message is identical (or at least compatible) in terms of its meaning, interpretation, and advice.	Deppa [7]; Conzola [3]; Wogalter [48]; Lehto [25]; Dreyfuss [12]			
7	Conspicuity / Noticeability / Salience	The noticeability or attention-getting aspect of the warning message – directly affecting the likelihood of its being perceived and attended to.	Dewar [8]; Rousseau [39]; Mackinnon [29]; Mayhorn [32]; Rodriguez [38]; Wogalter [49]			
8	Cost of Compliance	The expenditure of some relatively limited resource (e.g., time, money, effort) perceived as being necessary to follow a given instruction. May also entail emotional “costs” (e.g., loss of dignity, embarrassment, likely exposure to ridicule) likely to be incurred in following the instruction / warning.	Kalsher [20]; Dingus [9, 10]; Wogalter [45]; Godfrey [17]; Leonard [28]; Lenorovitz [26]			
9	Durability	The ability of the warning to remain visible/legible/noticeable over time while being exposed to the likely environmental conditions in which it’s placed. Often tied to the expected operating lifespan of the product, equipment, or system with which the hazard is associated.	Glasscock [16]; Dorris [11]; Wogalter [47]			
10	Explicitness	The extent to which the warning clearly and accurately conveys the exact nature of the hazard and its consequences – e.g., “Keep off the grass” is not a sufficiently explicit warning that the field of grass is typically infested with poisonous snakes.	Laughery [23, 24]; Martin [31]; Leonard [28]; Silver [40]; Langolis [21]			
11	Legibility / Readability	Use of appropriate letter typography, font, size, spacing, and contrast so as to ensure that a normally-sighted person can quickly, easily, and accurately read the message at the expected reading distance and under the lighting and viewing conditions likely to be present whenever the message is viewed.	Dewar [8]; Frascara [15]; Wogalter [47]; Smith-Jackson [42]			

Table 1 (Concluded)  
 Prototype Ratings Checklist for Warnings Adequacy Evaluations

Index No.	Warning Feature or Factor	Feature Meaning / Description (General Synopsis)	Source / Reference	Deficient	Adequate	Outstanding
12	Multi-language Presentation (As needed)	In certain situations (as dictated by the likelihood of a significant number of a product's users coming from various ethnic / cultural / social / country-of-national-origin groups) it may be advisable to present warnings / safety instructions in more than one language (e.g., English, Spanish, French, Portuguese)	ANSI Z535.4-2007, Annex D [1]; Robinson [37]; Foley [14]; Leonard [28];			
13	Placement / Location	Locating the warning with respect to the identified hazard so that its message is likely to be noticed and read by a potential victim in a position reasonably close to, but at a point <b>before</b> the hazard is actually encountered – i.e., where / when the hazard can still be avoided.	Glasscock [16]; Magurno [30]; Silver [40]; Wogalter [43,44]			
14	Redundancy / Warning Systems	A coordinated combination of multiple, mutually-supportive precautionary instructions appearing across several different media (i.e., redundant/supporting warning messages appearing in several places – such as affixed to the product, in an owner's manual, on product packaging, etc.). The net effect is to have an integrated system or network of messages rather than just a single message instance.	Wogalter [43,44]; Meyer [34]; Laughery [22]			
15	Targeted to Right Audience	Tailoring or expressing the warning in terms most appropriate / most likely to be understood by the types of people likely to be exposed to the hazard.	Fischhoff [13]; Smith-Jackson [41]; Wogalter [43,44]; Laughery [22]			

experts would be its intended user population.

It was not envisioned that this tool would be suitable for novices, nor was it expected that the tool would somehow instantly bestow “warning expert status” upon whoever tried to use it. Instead, it is assumed that this type of expertise is something that the user of the tool would bring to the arena him/herself. That is, perhaps the tool should come with its own set of precautionary instructions, (e.g., “Do not try to use this at home. This tool should only be used by professionals already familiar with and knowledgeable about warnings.”)

It should also be noted that warnings experts often are retained by attorneys who are representing clients in civil lawsuits. When warnings experts are called upon to testify in such litigation, and their credentials and standing have been recognized and accepted by the court, they become expert witnesses.

It is entirely possible for one warnings expert to have been retained by the attorney representing the plaintiff to testify on his/her behalf, and another warnings expert to have been retained by the attorney representing the defendant(s) to testify on their behalf. And, when the case involves differing views regarding the warnings issues involved – i.e., often with the plaintiff’s side claiming that a warning was needed, but none was provided, or that the one that was provided was inadequate; while the defendants’ side may be claiming that no warnings were needed, or that the one that was provided was entirely adequate for its purpose. In such situations a checklist tool such as this might prove to be of value to the warnings experts offering opinions on behalf of either party.

Both of these types of experts need to be able to substantiate and defend their respective opinions. And, this kind of a tool can be helpful to organize their thoughts and to better convey the logical reasons why / how either of them arrived at their respective conclusions.

It would seem likely that this kind of a scenario would give rise to the need to make use of the information contained in the fourth column of the table. This reference information may be particularly useful to perform additional background research, and to see if one or more of the original literature sources identified therein might contain additional information, data, or conclusions directly relevant to the specific point they are trying to make.

Here, it is worth pointing out that the space constraints of the table dictated that the references provided in that fourth column appear in a somewhat abbreviated form. Many papers, articles, and books

are prepared and submitted by multiple authors. However, the fourth column of the table lists only a single author for each citation. The interested reader will note that full citations for each such reference (including the complete listing of each co-authors’ name; the publisher of the book, journal, or periodical in which it appeared, and the relevant page numbers) are provided in the **References** section that appears at the end of this article.

Finally, some comment is warranted about the final three columns in the table – where the warnings expert is encouraged to place a checkmark in one of the three rating columns labeled: “Deficient”, “Adequate”, or “Outstanding”. There is nothing sacred about this particular type of three-point scale, or set of rating categories. A given warnings expert should feel free to use a 10-point, “bad” to “good” rating scale, a binary, “go”/“no-go” or “pass”/“fail” rating system, or whatever rating system best fits that expert’s mental model or adequacy evaluation scheme. These authors simply suggested this particular three-category scale, because it seemed to represent the right level of resolution or degree of granularity for the decisions being made, and because of the ease with which one can simply and quickly scan down the rating columns, note where the checkmarks fall, and thereby gain a quick visual impression of the overall quality level of the subject warning. If there are a lot of checkmarks piled up on the left (“deficient”) side of that part of the table, it would seem to justify a rather poor overall assessment of the warning, and/or it could help to quickly pin-point the particular warning features or factors most in need of further attention or improvement.

#### 4. Summary / Conclusions

This article described a prototype warnings feature checklist – one intended to help experts in their evaluations or assessments of a given warning system design or implementation. In a manner not unlike a preprinted grocery shopping item checklist, it presents and reminds one of a relatively small set of commonly needed items – ones that experience may have shown to be frequently relevant or appropriate, but that could well be overlooked at one time or another. The checklist tool was configured with a flexible and adaptable set of user needs in mind, but at the same time was intended to compactly present a core group of warning characteristics and key

areas of concern. The authors are convinced that such a relatively simple, but informative tool ought to be of value to its intended users – not only in conducting their uniquely individual warnings analysis processes, but also in their efforts to better organize their thoughts and more clearly convey their resulting conclusions and opinions to those in need of hearing and understanding them.

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