

REPORT

Literature review on the impact of label format on consumers' attention and comprehension for mandated label elements

Prepared For:

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Submitted July 2013

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2 Executive Summary

2.1 SCOPE

This review was undertaken for Food Standards Australia New Zealand (FSANZ) to support its technical evaluation and provision of advice in relation to the four following recommendations from the Blewett et al. (2011) report, *Labelling Logic: Review of Food Labelling Law and Policy*:

- Recommendation 6: That the food and safety elements on the food label be reviewed with the aim to maximise the effectiveness of food safety communication.
- Recommendation 47: That warning and advisory statements be emboldened and allergens emboldened both in the ingredients list and in a separate list.
- Recommendation 43: That the Perceptible Information Principle (PIP) be used as a guide for labelling presentation to maximise label comprehension among a wide range of consumers.
- Recommendation 17: That the declaration in the Nutrition Information Panel of amount of nutrients per serve be no longer mandatory unless a daily intake claim is made.

It is acknowledged that the understanding of labels is affected by a number of different elements including the content, terminology used, format and the knowledge/capacity of the consumer. Due to the broad scope of these elements it was agreed that this review would focus on the **format and presentation** of mandatory information, **not content**, because these elements are pertinent to responding to the Blewett et al. (2011) recommendations. The review was not looking at the content of front of packaging and other non-mandated label aspects, including models such as traffic lights. The research question was framed as:

"How to maximise the food labelling format and presentation for mandated information (such as the ingredient list, allergen information, date marking, directions for use and storage and nutrition information panel) in terms of communication effectiveness – based on consumer attention, accessibility, credibility, legibility, comprehension, understanding and use."

The specific objectives of the review were:

1. To identify the psychological, consumer behaviour, human factors and ergonomic models, conceptual frameworks and theories best suited to conceptualise the communication of mandated food label information to purchasers and consumers of packaged food products.
2. To define and articulate key concepts used in the models, frameworks and theories, including: attention, accessibility, credibility, legibility, comprehension, understanding, use and effectiveness.
3. To identify (i) how the Perceptible Information Principle could and has been used to maximise food label comprehension across a wide range of consumers; and (ii) what other tools could provide similar guidance – including whether the presentation of information in multiple modes is required.
4. To identify (i) how the format (e.g. font, colour, contrast, position, bolding, amount of information, use of lines/columns/tables, and consistency across packaging) of mandated food label information impacts on consumers' and purchasers' attention, accessibility, credibility, legibility, comprehension, understanding, use and

effectiveness and (ii) the relative importance of various aspects of label element format.

5. To identify how other factors such as believability, authoritativeness, and whether the label elements are mandated by government or provided voluntarily by the manufacturer, impact on attention, accessibility, credibility, trust, legibility, comprehension, understanding, use and effectiveness of label information.

2.2 METHODS

Key words were used to search academic peer-reviewed literature and grey literature for relevant articles. Additional inclusion and exclusion criteria were used to identify articles to be included in the review (61 articles were included from the 4862 that were originally sourced). Annotated summaries were created for each of the items that met all the inclusion criteria and the findings were drawn from these summaries.

2.3 REVIEW FINDINGS

The review identified a number of conceptual frameworks that had the potential to be of relevance. The Attention, Knowledge and Compliance (AKC) model was found to be the best fit to the review task. While focused on warnings, the model provides a very relevant conceptual framework for the key steps of attention, knowledge and gaining a desired behaviour (e.g. compliance) and providing direct links under each stage to the key design elements. The broad framework provided by the AKC model has been used for structuring the report and organising the findings.

The AKC model provides an overarching framework to guide the design of food labels but tools and recommendations are also needed to operationalise the framework. There was no literature on the use of the Perceptible Information Principle in food labelling and further enquiries were unsuccessful in sourcing additional information. However, other similar guidelines from the Institute for Safe Medication Practices (ISMP 2013), the Food Standards Agency (Food Standards Agency 2008) in the United Kingdom and Buckley & Shepherd (1993) were located. These provide specific recommendations for the formatting of food labels within the categories of: font type and format; contrast; layout; surfaces; shapes; and terminology. These recommendations are comprehensive but do not distinguish between attention and knowledge acquisition.

All studies identified in the search were reviewed to identify how the format of mandatory information on food labels impacts on attention and knowledge acquisition, as well as compliance.

The factors that gain attention and support knowledge acquisition are presented in

Table 1 and Table 2 respectively. These tables also include those factors recommended by the Food Standards Agency (2008), ISMP (2013) and Buckley & Shepherd (1993). Details on compliance (how the factor impacts on consumer behaviour) have not been included in these tables but are included in Table 6 and Table 7 in sections 4.3.1 and 4.3.2. No evidence was found describing the relative importance of each of the factors. However, those variables, which have been highlighted in yellow, have evidence for their ability to impact on attention or knowledge acquisition, not simply a finding that consumers prefer a particular design feature.

Table 1 Factors and variables that gain attention (those highlighted in yellow have evidence for their impact on attention)

Factors	Variables that gain attention
The shape of the area containing the information	<ul style="list-style-type: none"> • An octagon and a circle with an arrow pointing into it. • An equilateral triangle with a downward point. • A diamond. • A hexagon. • Equilateral triangles pointing up and to the right.
The location of information	<ul style="list-style-type: none"> • Include important information on the front of products. • Information attached as a tag. • Labels that require interactivity, e.g. tape the label across the opening of the product.
The size of the information	<ul style="list-style-type: none"> • Increase the size of warnings. • Reduce the information surrounding the message. • For warnings on tobacco in Canada formatting rules stated that: <ul style="list-style-type: none"> – “The type size of the text of the warning or message accounts for not less than 70 per cent of the area in which it is displayed. – The text of the warning or message is centred within the area in which it is displayed. – The text of each message is displayed within an area that occupies not less than 20 per cent of each of the two largest principal display surfaces of the package”. (Crane & MacLean 1996, p50) • Increase the amount of label space on food given to mandatory information so that it is comparable in size and prominence to commercial information.
The use of colours and symbols	<ul style="list-style-type: none"> • The use of pictorials. • Increase the visual salience (ability of the nutrition label to grab attention), e.g. by using contrast.
The direction of text	<ul style="list-style-type: none"> • Text to be printed horizontally rather than vertically.
The use of signal words	<ul style="list-style-type: none"> • Use of a signal word to attract attention, e.g. danger, warning, caution.

Table 2 Factors and variables that aid knowledge acquisition (those highlighted in yellow have evidence for their impact on knowledge acquisition)

Factor	Variables that aid knowledge acquisition
HOW THE INFORMATION IS DISPLAYED	
The inclusion of graphics	<ul style="list-style-type: none"> • Whether information should be presented as a symbol or text depends somewhat on the type of information. For example, an ingredients list can only be in text but symbols may work well for allergen information. • Upward and rounded designs, as well as right-aligned graphics. • The use of short instructions, icons and explanation of why it is important to follow the instructions to convey safe handling instructions for food. • The use of unambiguous symbols. • Nutrition labels that use graphics, symbols, adjective labels and include minimal numerical content. • No more than five geometric shapes and no more than nine colour combinations of hue, brightness and saturation on any one label. • There needs to a standard icon system.
The use of tables	<ul style="list-style-type: none"> • The use of tables simplifies the presentation of information.
The order in which information is presented	<ul style="list-style-type: none"> • Nutrients positioned according to health relevance, with the more relevant at the top of the label.
The amount of information on the label	<ul style="list-style-type: none"> • Reduce visual clutter (the number of components on the label). • Reduce the amount of information on labels. • Reduce the number of nutritional claims. • Maximise the amount of white space while managing the readability of the text.
The location of information	<ul style="list-style-type: none"> • Position nutrition labels centrally. • The text of the message should not be altered in any way when the package is opened. This will ensure that the text can read even after the package is open. • Include the nutrition panel and list of ingredients together. • Include a short claim on the front of the food package and more detailed instructions elsewhere on the outer package. • Group text into separate, conceptually related sections to facilitate searching and acquisition of information.

Factor	Variables that aid knowledge acquisition
The location of allergen information	<ul style="list-style-type: none"> • Allergens should be listed in the ingredients list. • Include specific allergy information above the ingredients list to avoid searching.
The space allocated to mandatory information	<ul style="list-style-type: none"> • Give information about ingredients and additives more prominence on labels.
The consistency with which information is presented across different labels	<ul style="list-style-type: none"> • Present information in a consistent location on all packages. • Use a standardised approach to presenting allergy information or have a standardised symbol to indicate allergens. • Use terminology that consumers are familiar with.
Difficulty interpreting numbers on the nutrition panel	<ul style="list-style-type: none"> • Use rounded numbers rather than decimals. • Use non-numerical descriptions on the nutritional panel. For example, specifying whether the fat, salt or protein levels in the product are high or low. • On the nutrition information panel display nutrient amounts in percentages rather than in metric units.
The use of alternative methods for delivering information	<ul style="list-style-type: none"> • The use of technology to provide detailed food safety information. • Use of a labelling system.
STYLE	
The use of lines	<ul style="list-style-type: none"> • Thinner lines (1/4 point) between pieces of information on the nutrition panel or grey shading to divide sections of the food label or nutrition information panel.
The use of colours	<ul style="list-style-type: none"> • There are different opinions on the colours that should be used on labels. Some studies say colour is better, whereas others say that black text on white background is better. • Avoid glossy/shiny labels. • Use black type on a white background or good tonal contrast of at least 70%. • Ensure optimal contrast between the text and background. • Ensure that critical information on labels is conveyed not only in colour, but also in text. • Use red and the octagon shape to indicate hazards. • Colour labels. • The combination of red and the octagon shape.
Fonts used	<ul style="list-style-type: none"> • Bigger font size is needed. There are varying recommendations for the exact size (e.g. either 10-point size or 12-point size) and this will in part depend of the level of importance of the information. • Avoid the use of all upper case letters. • Use TALL man lettering. • Use a sans serif font such as Helvetica type rather than Times or Goudy for key information. • Use bold font rather than unbolded font, as long as the print quality is high.
Presentation of text	<ul style="list-style-type: none"> • Avoid having text blocks at right angles to each other. • Avoid print that curves around a container. • Avoid placing words over illustrations, having busy backgrounds or watermarks. • Include adequate spacing between lines of print. • Left aligned text. • Text printed horizontally rather than vertically.
TRUSTWORTHINESS	
The trustworthiness of the information presented	<ul style="list-style-type: none"> • Include quantitative information on nutritional panels.

2.4 GAPS IN THE LITERATURE

This review has provided evidence to assist in evaluating and responding to the four recommendations. Many studies reviewed are specific to the nutrition information panel, warnings on products or medication labels; however it is likely that principles about formatting will transfer between these contexts because the sizes of the labels are comparable and similar principles will be needed to gain attention, as well as support knowledge acquisition and compliance. There is a need to conduct studies investigating the actual-use (rather than self-reported use) of labels by consumers in supermarkets and the use of technology to augment the information provided on labels. Within these

studies there is a need to investigate the optimal font, text size, colour and format for mandatory information.

3 Project scope and approach

3.1 CONTEXT AND PURPOSE

The report *Labelling Logic: Review of Food Labelling Law and Policy* (Blewett et al. 2011) was presented to the commissioning Australia and New Zealand Food Regulation Ministerial Council in January 2011. Sixty-one recommendations were made in the report that relate to food labelling, four of which have been referred by the Legislative and Governance Forum on Food Regulation to Food Standards Australian New Zealand (FSANZ) for technical evaluation and advice.

Two of the recommendations relate to the format, presentation and legibility of food safety and warning and advisory label elements:

- Recommendation 6: That the food safety elements on the food label be reviewed with the aim to maximise the effectiveness of food safety communication.
- Recommendation 47: That warning and advisory statements be emboldened and allergens emboldened both in the ingredients list and in a separate list.

A third recommendation that has been referred to FSANZ deals with presentation more generally:

- Recommendation 43: That the Perceptible Information Principle be used as a guide for labelling presentation to maximise label comprehension among a wide range of consumers.

A fourth recommendation referred to FSANZ deals with aspects of the content of the nutrition information panel:

- Recommendation 17: That the declaration in the Nutrition Information Panel of amount of nutrients per serve be no longer mandatory unless a daily intake claim is made.

FSANZ commissioned *instinct and reason* to review the literature in relation to the four recommendations, specifically examining the evidence for the impact of label format, presentation and legibility on consumers' attention, accessibility, understanding and use of mandated label elements. This review, which focuses on format rather than content, addressed Recommendation 17 to the extent that the recommended removal of a column of information interacts with the format, presentation and legibility of the remaining label elements.

For this project *instinct and reason* collaborated with qualified academics and experts with skills and knowledge in relevant disciplines of psychology, marketing, human factors and ergonomics.

3.2 PROJECT SCOPE AND DEFINED RESEARCH QUESTION

To assist FSANZ to respond to the above-mentioned recommendations it was agreed, during a scoping process with FSANZ, that the literature review would be guided by the research question:

How can we maximise the food labelling format and presentation for mandated information (such as the ingredient list, allergen information, date marking, directions for use and storage and nutrition information panel) in terms of

communication effectiveness based on consumer attention, accessibility, credibility, legibility, comprehension, understanding and use?

It is acknowledged that consumer understanding of food labels is affected by a number of different elements including the content, terminology and format, as well as the knowledge and capacity of the consumer. There is some overlap between each of these elements, however due to their broad scope the review focused on the format and presentation of mandated information, since these aspects are pertinent to responding to the recommendations. Mandated information encompasses:

- Food identification (use of prescribed name or inclusion of a description)
- Lot identification
- Name and business address of supplier
- Mandatory warning and advisory statements and declarations
- Labelling of ingredients
- Date marking of food
- Directions for use and storage
- Nutrition information
- Percentage labelling
- Country of origin labelling (Australia only)
- Special purpose foods, including amino acid modified foods (New Zealand only)
- Genetically modified foods
- Irradiated foods (FSANZ 2011).

To address the research question the specific objectives of the literature review were:

1. To identify the psychological, consumer behaviour and human factors and ergonomic models, conceptual frameworks and theories best suited to conceptualise the communication of mandated food label information to purchasers and consumers of packaged food products.
2. To define and articulate key concepts used in the models, frameworks and theories, including: attention, accessibility, credibility, legibility, comprehension, understanding, use and effectiveness.
3. To identify (i) how the Perceptible Information Principle could and has been used to maximise food label comprehension across a wide range of consumers; and (ii) what other tools could provide similar guidance – including whether the presentation of information in multiple modes is required.
4. To identify (i) how the format (e.g. font, colour, contrast, position, bolding, amount of information, use of lines/columns/tables, and consistency across packaging) of mandated food label information impacts on consumers' and purchasers' attention, accessibility, credibility, legibility, comprehension, understanding, use and effectiveness and (ii) the relative importance of various aspects of label element format.
5. To identify how other factors such as believability, authoritativeness, and whether the label elements are mandated by government or provided voluntarily by the manufacturer, impact on attention, accessibility, credibility, trust, legibility, comprehension, understanding, use and effectiveness of label information.

These objectives were expansive in their scope hence the evidence was examined specifically with respect to the four specific labelling recommendations indicated in section '3.1 Context and purpose'; except where a broader perspective was especially pertinent. For example, it was discussed at the scoping meeting that it may be valuable to explore the design of warning labels, as well as the models and principles used to guide their formatting. The purpose of reviewing this information was to consider how these models and principles may apply to elements of food labels.

This report is presented as follows: the literature search strategy used; the review findings (the available models, the perceptible information principle, tools similar to the perceptible information and label format factors that impact on consumers); gaps in the literature; and the conclusion.

3.3 LITERATURE SEARCH STRATEGY

Based on the requirements of the project, budget and time limitations it was agreed that a realistic review method within clearly defined parameters would be followed; it was acknowledged at the scoping meeting that due to the context of the literature review a strictly systematic approach would not be appropriate. An iterative approach was taken in which FSANZ was contacted on a number of occasions as the review progressed to reassess the scope and extent of the review.

3.3.1 Sources and search terms

Published literature was located through four methods: (1) FSANZ provided existing literature published by them that was considered relevant; (2) electronic databases (PubMed, Medline, Web of Science, PsycINFO, Proquest Central, Science Direct, Informit, EBSCOhost and Emerald) were searched using the SuperSearch facility at the Australian National University library to access the databases in a single search. The search was conducted using the terms listed in Table 3; (3) the National Library of Australia and Google Scholar were searched using the terms listed in Table 3 to identify grey literature; and (4) the reference lists of key publications were reviewed.

Table 3 Search terms

Search Terms
("Plain English") or ("Perceptible Information Principle") or ("Task based") or "User centred design" and: (label or ingredient)
(label) or (product labelling) and (authority, credibility, believability, trust)
Label and (Medicine or poisons or safety) and (format OR comprehension)
(Label or product labelling) and (comprehension or readability or legibility or noticeability or ergonomics or typography)
(Label or ingredient) and (consistency or voluntary or mandatory) and (comprehension, or readability or legibility or ergonomics or typography) or (authority, trust, credibility, believability)
"Food label" ("Food label") and (ergonomics or socioeconomic) ("Food label") and (presentation or format or design or font or colour or eye tracking) ("Food label") and (Mandatory information) ("Food label") and (ingredient list or ingredient information or sugar or salt or fat) ("Food label") and (allergen) ("Food label") and (consumer behaviour) ("Food label") and (impact)
"nutrition information" ("Nutrition information") and (consumer behaviour) or (serving size or calorie or fat or sodium) ("Nutrition information") and (comprehensive)
"ingredient information" and "food"
"food package" and "consumer"
Elderly and food label
("Food label") and (Indigenous)

3.3.2 Inclusion and exclusion criteria

Criteria for including and excluding articles were decided prior to commencing the review and are listed below.

The inclusion criteria were:

- Articles describing relevant theories and conceptual frameworks (across different disciplines) that have been employed to explain how best food labels relating to the mandatory information (e.g. tables) are presented and formatted, especially why they work and what makes them effective.

OR

Articles providing evidence for the effectiveness of label formats, with particular reference to the key concepts used in the identified models and theories.

- Articles published since 1987, i.e. in the past 25 years.
- Peer reviewed literature involving empirical data and/or a strong theoretical basis, and/or published reports or studies in the grey literature from recognised government and non-government agencies.
- English language publications from Australia, New Zealand, United States of America, United Kingdom (including literature in English via the European Union) and Canada.
- Research reports containing an explicit methodology and report of outcomes (i.e. it needs to be peer reviewed or published by one of the organisations identified above in sources).
- All packaged foods including beverages.

The exclusion criteria were:

- Studies reporting on the content of food label information, i.e. the types of nutrient profiling systems.
- Front of packaging and other non-mandated label aspects, including models such as traffic lights.
- Warning labels on alcoholic beverages.
- Opinion pieces/editorial comments.

Initial searches identified the need to broaden the inclusion criteria to include earlier literature, as well as broader literature relating to other types of signs and labels not initially included in the search, such as literature relating to warning/hazard signs and labels.

3.3.3 Process for reviewing articles and extracting information

Titles and abstracts (where available) were screened to determine eligibility of articles using the criteria listed in the previous section. Wherever possible, the search identified literature relating to sub groups of the population. This included aged/elderly, less educated (or less literate, lower socio economic status), people from non-English speaking backgrounds (or culturally and linguistically diverse backgrounds) and Aboriginal and/or Torres Strait Islander people, Maori and Pacific Islanders (Indigenous).

The full-text article was retrieved for all eligible articles, those where there was doubt as to the article's eligibility, and those where the abstract was not available. An annotated summary of the findings was created for all full-text articles sourced. This step involved creating, in consultation with FSANZ, a database/spread sheet structure and a set of

assessment criteria. This assessment was used to determine the validity of the findings and was referred to when determining which factors would be presented in section '4.3 Components of the label'. The annotated summary of findings included the following information for each article:

- Citation details
- Summary statement from online abstract where appropriate and available
- An assessment of relevance to the research question
- Purpose of study
- Methodology
- Sample
- Main outcome measures
- Main findings
- Evaluation of claims made, including the identification of any limitations
- Assessment of study quality (high, medium or low)
- Questions raised/gaps indicated
- Whether study investigated self-reported label use or actual use
- An appraisal of the quality of the study in terms of quality, credibility, accuracy and their applicability. This was determined using a criterion scoring system as indicated in Table 4. Both qualitative and quantitative studies were assessed using these criteria. Qualitative studies were likely to receive a lower score because they could only be rated on four of the criteria (relevance to the research question and specific objectives, adequate sample size, clear description of the intervention and peer review status). The potential for qualitative studies to receive a lower score reflects that this type of evidence is viewed as lower on the hierarchy of evidence; however, it did not exclude them from the review but rather meant greater caution was given to literature with lower scores.

Table 4 Criteria for evaluating articles

Quality Criterion	Score
1. Relevance to the research question and specific objectives	2 = high, 1 = medium, 0 = low/no
2. Comparison or control groups	1 = yes, 0 =no
3. Randomisation (probability based selection of sample)	0.5 =yes, 0= No
4. Adequate Sample size	0.5 = yes, 0=no
5. Statistical control for confounding factors	1 = yes, 0= no
6. Clear description of the intervention	1 = yes, 0= No
7. Peer Review status	Subtract 1 point if the study has not been peer reviewed

If an article was deemed ineligible when the full-text article was reviewed the relevance of the article was assessed as '0', a reason was given for this score and not applicable (NA) was recorded for the remaining criteria.

3.4 NUMBER OF ARTICLES RETRIEVED

The number of citations at each stage of the review was recorded (see Figure 1).

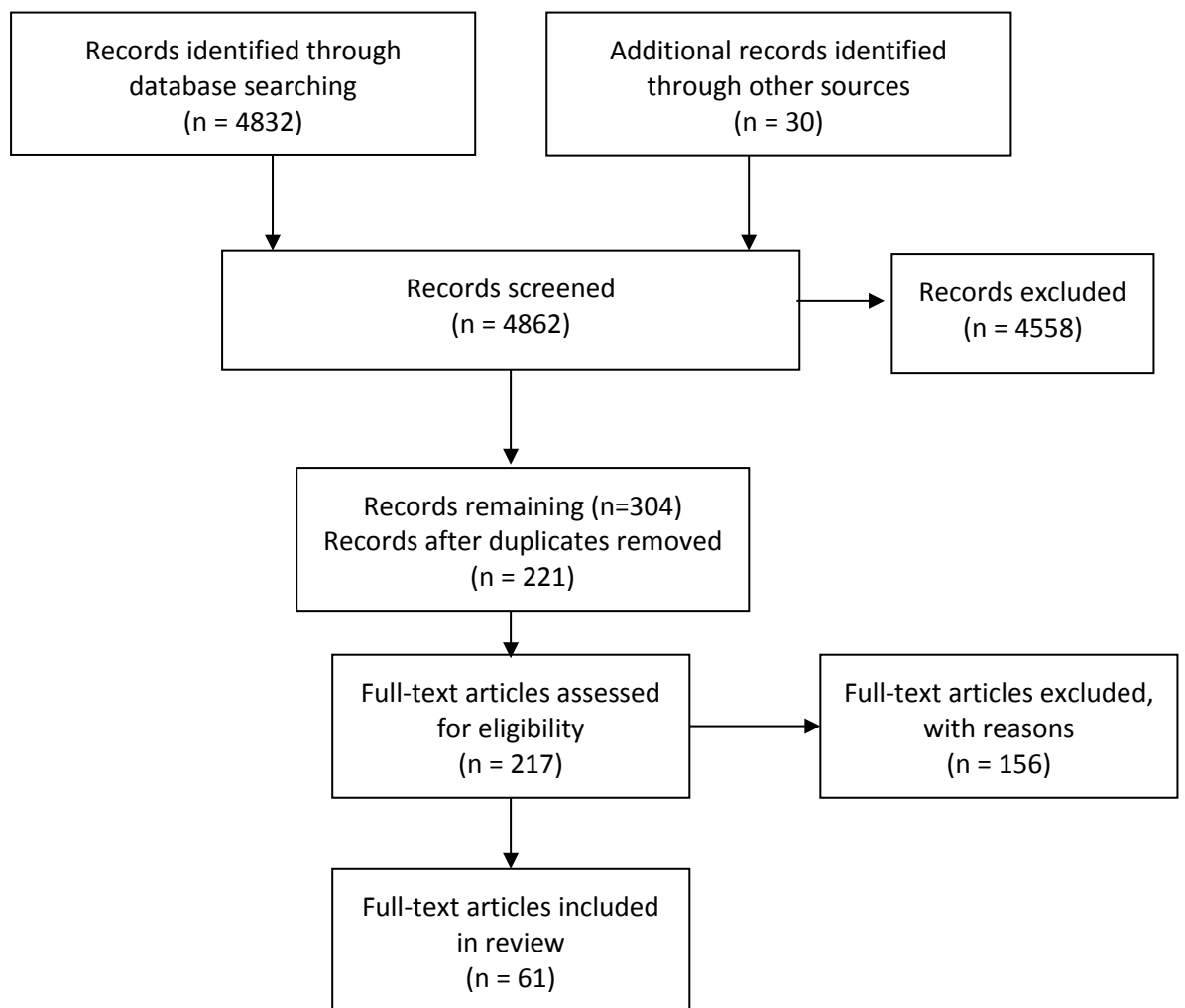


Figure 1 Number of articles retrieved at various stages of the review process

4 Review findings

4.1 CONCEPTUAL FRAMEWORKS/MODELS

The review identified a number of models, conceptual frameworks and theories that had potential to conceptualise the communication of mandated food label information to purchasers and consumers of packaged food products.

The eleven models, conceptual frameworks and theories were identified as potentially being relevant:

- Elaboration likelihood model (ELM)
- Persuasive Communications Theory
- Human information processing
- Consumer decision making and attitude formation and change
- Conceptual framework of consumers' understanding and use of information on food labels
- Perceptual model for food labelling
- Information interaction
- Evaluability principle
- Proximity Compatibility Principle (PCP)
- Attention, Knowledge and Compliance (AKC) Model
- Principles of universal Design

The models most relevant to the review objectives were human information processing, the Attention, Knowledge and Compliance (AKC) Model and the principles of universal design. These three models are described below, including assessment of their strengths, weaknesses and applicability to the research objectives. Descriptions of the remaining models, deemed less relevant to the review, are included in Attachment 1.

Overall analysis of the models

Human information processing

Referenced from the paper, Bettman *et al*, *Cognitive considerations in designing effective labels for presenting risk information*, 1986

Outline of the model:

- It is argued by Bettman *et al*. (1986) that there is extensive evidence from both basic and applied research that the same information presented in different formats can result in different decisions. Therefore, by understanding how consumers process information, designers can predict more accurately the effects of a particular format.
- Numerous studies were indicated to show that coping with information about risk is complex and difficult (relevant to warning elements of mandatory information) and that consumers will ignore information, which they feel, has little benefit.
- Bettman *et al*. (1986) also indicate that there is empirical evidence that people also find it difficult to trade off risks against benefits, particularly when the information is not readily available or easy to use and compare.
- It is explained that the set of memories and processes that interact with the environment to produce behaviour can be divided into three major subsystems: (1) the perceptual system consisting of sensors or receptors such as eyes and ears and associated buffer memories; (2) the motor system that translates thought into action by activating patterns of voluntary muscles; and (3) the cognitive system comprising

of the working/short term memory and the long-term memory – it is the cognitive system that Bettman et al. (1986) suggest is the most important to understand for designing effective labels.

- There are limits to the working memory processing (with seven items plus or minus two usually the recognised limit) and information in working memory can be lost in 20 to 30 seconds if not actively rehearsed, with the storage of an information piece to long-term memory taking seven seconds. Therefore there are limits to how much information it is reasonable to expect a consumer will be able to process from a label.
- As a result, people often do not transform the information, but instead process it in the form given, meaning that the same information given in different formats (e.g. risk per trip versus risk per lifetime) can have a different impact on a person's decision. In addition, people use heuristics to process, simplify the search and solve a problem. Based on this Bettman et al. (1986) indicate a major goal in the design of information systems is to take advantage of the power of heuristics, and simpler labels encourage the use of heuristics, including the effective chunking of information.
- At the same time storage of information in long-term memory involves encoding and organising operations. Presenting information in semantic associations enhances the ability to code it, because information is coded in terms of relationships between concepts. Consequently, the acquisition of new knowledge from labels appears to be greatly facilitated by the existence of previously acquired relevant knowledge that can be used in the form of associations. In addition, it is suggested that long term memory is organised in hierarchical clusters of related knowledge and studies have shown that information learned in an organised hierarchical fashion can be recalled much more effectively.
- Thus merely making information available may not be sufficient and instead information must be both available and easily processable to be utilised.
- Bettman et al. (1986) indicate that consumers use different processing strategies depending upon the task and that different types of processing are facilitated by different types of formats and organisations of information. In other words, no one format is optimal for all types of information and/or situations and thus processability depends upon the congruence between the format and organisation of the information and the type of processing to be done.
- Based on the above, Bettman et al. (1986) provided three major considerations and corresponding recommendations:
 1. Reducing the cognitive effort and/or time needed to locate externally available information, retrieve and previously stored information, and encode the newly provided information by...
 - Making important information more salient via colour and/or type size
 - Using a common organisation for information on all labels
 - Designing the common organisation hierarchically and in a manner compatible with the scheme used by most consumers to store information about the product
 - Using symbols which quickly convey the concept when possible
 2. Reducing the cognitive effort and/or time needed to make risk-benefit trade-offs within a particular brand or alternative being considered by...
 - Collecting information on benefits in one place on the label
 - Collecting information on risks in one place on the label
 - Organising the label so that information on benefits and risks are in close proximity
 3. Reducing the cognitive effort and/or time needed to make comparisons across different brands or alternatives by...
 - Providing information in a relative or comparative format
 - Considering in-store comparative lists in addition to labels
- Bettman et al. (1986) provided specific examples of proposed formats based on this model.
- Added to the above, Bettman et al. (1986) proposed the use of a labelling system

using four different modes of communication (advertisements, point of purchase displays, labels and packaging inserts) to combine to achieve the desired outcome prior and during purchase and when product is in use.

- Finally, Bettman et al. (1986) recommended that the hazard level for particular populations should only be made on the label if the subpopulations are 'reasonably' large (e.g. children) or if the dangers are especially severe for this subpopulation (e.g. a potentially fatal allergic reaction).

Strengths and useful elements:

- The model provides useful human information processing conceptual frameworks to take into consideration in label formatting and presentation and useful broad guidelines based on responding to the conceptual frameworks.

Weakness of the model for the purposes of the review

- The broad guidelines for labelling were deduced or hypothesised based on the human information processing conceptual frameworks explored rather than tested and confirmed. In addition, while the guidelines provide useful broad direction they do not provide specific instruction on label design details.

Conclusion as to the applicability of the model for the review objectives

- The conceptual framework and broad recommendations provide some specific guidance (e.g. collecting similar information in the same space on the label) but also broader suggestions (e.g. making information more salient via colour and/or type size). Before these broader suggestions can be operationalized, further information is required as to what aspects of colour and type size make information more noticeable. This model provides useful broad recommendations, however its focus is narrower and includes less specifics than the Attention, Knowledge and Compliance model.

Principles of universal design

Referenced from the paper, *Story, Maximizing usability: The principles of universal design, 1998.*

Outline of the model:

- Universal design is the design of products and environments so that people of all ages and abilities can access them. It attempts to change the built environment to minimise the need for the individual to change or use assistive devices and to maximise their inclusion in activities (Story 1998).
- Story (1998) explains that universal design differs from accessible and adaptable design accessibility is integrated from the beginning of the design process and solutions are therefore less noticeable. For example, accessible design and adaptable designs can look tacked on such as ramps alongside entrances (accessible design) with stairs or large grips for kitchen utensils (adaptable design). Although universal design may employ adaptable design strategies to allow customisation for each person, it is best if the design solutions are presented equally to all people, not just those with a disability (e.g. a height adjustable cooktop that can move between low for short or seated cooks and high for tall or standing cooks).
- Universal design can apply to all design principles including product and graphic design, as well as communication (Story 1998).
- Based on the existing knowledge base the Centre for Universal Design at North Carolina State University identified characteristics that make products and environments usable by the greatest diversity of people. Story (1998) details how these characteristics were grouped into the following seven principles of universal design:
 - Equitable use – the design is useful and marketable to people with diverse abilities
 - Flexibility in use – the design accommodates a wide range of individual preferences and abilities
 - Simple and intuitive use – use of the design is easy to understand, regardless

- of the user’s experience, knowledge, language skills or current concentration level
- Perceptible information – the design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities
- Tolerance for error – the design minimizes hazards and the adverse consequences of accidental or unintended actions
- Low physical effort – the design can be used efficiently and comfortably and with a minimum of fatigue
- Size and space for approach and use – appropriate size and space are provided for approach, reach, manipulation and use regardless of the user’s body size, posture or mobility (Story 1998).”
- The Blewett et al. (2011) report recommended that the Perceptible Information Principle (PIP) be used as a guide for labelling presentation to maximise comprehension among a wide range of consumers. The PIP is one of seven principles for universal design established by Connell et al. (1997) to guide the evaluation and design of usable products and environments. The principle states that ‘*the design communicates necessary information effectively to the user regardless of ambient conditions or the user’s sensory abilities*’ (Connell et al. 1997).
- Use of the PIP involves application of the following guidelines:
 - Use of different modes (e.g. pictorial, verbal and tactile);
 - Provide adequate contrast between essential information and its surroundings;
 - Maximise legibility of essential information;
 - Differentiate elements in ways that can be described; and
 - Provide compatibility with a variety of techniques or devices used by people with sensory limitations (Connell et al. 1997).
- The North Carolina State University lists projects that have or are being undertaken on the seven principles of universal design. Those that are listed as encompassing the PIP are related to architecture, exhibit design, industrial design, interior design and landscape architecture; none were listed as relating to product labelling (The Center for Universal Design n.d.). In addition, no scholarly articles, or any articles, were identified in which the PIP has been explicitly applied in the context of food labels or consumer behaviour. The Center for Universal Design and authors of the PIP were contacted but they were not aware of any instances where the PIP had been used to guide the design of food labels.

Strengths and useful elements:

- On face value it appears that the PIP could be used to guide the design of food labels; the principles are general but still have relevance to consumers’ engagement with food labels.

Weakness of the model for the purpose of the review:

- The model has not been used in the design of labels and there is little information to support its use.

Conclusion as to the applicability of the model for the review objectives:

- The PIP identifies the elements of a label that are important for conveying information, however specific guidance on each element is not provided. For example, the third element is ‘maximise legibility of essential information’ but specific recommendations are not provided as to how legibility can be maximised.

Attention, Knowledge and Compliance (AKC) Model

Referenced from the paper, *Laughery and Wogalter, A three-stage model summarizes product warning and environmental sign research, in press*. Attachment II provides an illustration of the model.

Outline of the model:

- Theoretical efforts regarding warnings have generally been based on one or both of two classic theoretical perspectives: communications theory and human information processing theory.
- Wogalter et al. (1999) combined the communications and information processing models into a unified theoretical framework, referred to as C-HIP.
- The C-HIP framework includes: (1) Source; (2) Channel; and then receiver stages of (3) Attention [notice and encode], (4) Comprehension, (5) Attitudes and beliefs, (6) Motivation, and (7) Behaviour. At each stage there are also feedback loops indicating that what occurs at one stage may influence other stages.
- Laughery and Wogalter (in press) used somewhat simpler approach for their research based on a three-stage model that globally covers the main parts of C-HIP model's Receiver section. The three stages are: Attention, Knowledge and Compliance (AKC model). The three-stage AKC model differs from the C-HIP model by focusing only on the main stages of the Receiver portion of the C-HIP, which makes sense for this current project, which is focusing on label format and presentation in terms of mandatory information.
- In addition, the model identified that there are design and non-design factors that influence each stage. For the purposes of this project the focus is on the design factors due to the relevance to format and presentation.
- The following provides a breakdown of the model:
 1. Attention stage includes noticing, attention getting, and attention switch and the design factors that have shown significant effects are:
 - Location – placed where it is likely to be encountered
 - Size – bigger is generally better
 - Colour – hue differences for prominence
 - Contrast – brightness differences; black on white or vice versa for greater legibility
 - Format – “chunked” text and outline/bulleted lists attract attention better than large dense paragraphs of text.
 2. Knowledge stage includes comprehension, memory, beliefs, and some decision-making and the design factors that facilitate warning effectiveness with respect to knowledge include:
 - Well-known terms – meaningful high frequency terms
 - Signal word – Bold printed words that are intended to convey levels of hazard
 - Connotation – Meaningful non-verbal elements such as colour connote hazard
 - Brevity – Promotes comprehension because more people will read shorter text
 - Format – potentially show some organized structure to the information via format, such as in bulleted, numerical or outline format
 - Explicitness – giving specific information rather than general information
 - Symbols/Pictorials – potentially a picture can be worth a lot (perhaps a thousand words) if it conveys meaning quickly
 3. Compliance stage includes compliance intent, motivation, some compliance decision-making, and behaviour and the design factors important for compliance include those already discussed with respect to attention and knowledge and with specific emphasis on:
 - Explicitness – more explicit information influences compliance
 - Pictorial symbols – by communicating instruction information, enabling informed cost-benefit trade-off decisions and with benefiting audiences where literacy and language barriers exist.

Strengths and useful elements:

- While focused on warnings, the model provides a very relevant conceptual framework for the key steps of attention, knowledge and gaining a desired behaviour and providing direct links under each stage to the key design elements.

Weakness of the model for the purposes of the review

- The model is not specifically focused on food labels.

Conclusion as to the applicability of the model for the review objectives

- The model provides a very relevant and practical conceptual framework in relation to this project and the focus on label format and presentation for mandatory information.

While many of the models described above provided useful broad conceptual frameworks for how people engage with information and more specifically labels, they were generally limited in their reference to formatting. Therefore, while there were some elements taken into account in the interpretation of the literature findings, they were not used as the guiding framework.

The Attention, Knowledge and Compliance (AKC) model was found to be the best fit to the review task. While focused on warnings, the model provides a very relevant conceptual framework for the key steps of attention, knowledge and gaining a desired behaviour (e.g. compliance) and providing direct links under each stage to the key design elements. The broad framework provided by the AKC model in terms of attention, knowledge and compliance has been used for structuring the report and organising the findings. Due to additional factors and items being identified across all the literature, the report does not directly follow all the sub-elements of the model.

4.2 TOOLS

Apart from the PIP described in the principles of universal design, no other explicitly named tools were identified to guide the design of food labels. However, specific recommendations from the Institute for Safe Medication Practices (ISMP 2013), the Food Standards Agency (Food Standards Agency 2008) in the United Kingdom (UK) and Buckley & Shepherd (1993) were located. Each of these recommendations has been developed based on empirical findings, which provides insight into compliance.

Guidelines from the Institute for Safe Medication Practices

The specific recommendations from the Institute for Safe Medical Practices that may translate to food labelling include (ISMP 2013):

1. Label formats should include larger fonts, lists, headers, whitespace, simple language and logical organization to improve readability and comprehension.
 - Minimum font size should be 12-point
 - Standardized font sizes such as Arial or Verdana should be used. Italic, oblique, narrow or condensed fonts should be avoided
 - Numeric characters should be used rather than alphabetic characters, when appropriate
 - Use typographical cues, i.e. bolding and highlighting for patient information only
 - Include only horizontal text
 - Maximise the amount of white space while managing the readability of the text
 - Thicker, denser line letters make text easier to read
 - Enhancing line spacing, makes pharmacy labels easier to read
 - Use a white background colour to allow better visualisation of text
 - Use black ink for all barcodes
 - Organise the label content in a patient-centred manner:

- Group text into separate, conceptually-related sections to facilitate searching and acquisition of information
 - Pharmacy details (e.g. name, address and phone numbers) should be separated at the bottom of the label away from the dosage instructions
2. Provide explicit instructions to improve patient comprehension
 - Include specific dosing/interval times, e.g. 'Take 2 tablets in the morning and take 2 tablets in the evening' NOT 'Take two tablets twice a day.'
 - Use numbers instead of alphabetic characters.
 - Avoid awkward terms such as 'twice', instead use 'two' or '2.'
 - Use mixed case (upper and lower case letters)
 - Avoid using abbreviations for dangerous drug names, dosage instructions or units of measure
 - Simplify the language, avoiding unfamiliar terms
 3. Drug names on the label should be separate and distinct from all other information
 4. Use a standard icon system for signalling and organising auxiliary warnings and instructions
 5. Use the largest font size that the label will allow with a minimum 18-point type for people with low vision.
(ISMP 2013)

Guidelines from the Food Standards Agency

The UK Food Standards Agency has provided best practice advice in a table for the design of food labels (see Attachment III) (Food Standards Agency 2008). These recommendations are grouped into the categories: font type and format; contrast; layout; and surfaces. In addition to these recommendations the Food Standards Agency has suggested that when using voluntary allergen boxes that the name of the allergen used is the one that must legally appear in the ingredients list, i.e. 'milk' not 'casein'. It is also recommended that if the voluntary box is included it should be in the same field of vision as the ingredients list (Food Standards Agency 2008).

Recommendations from Buckley & Shepherd (1993)

In the 1990s the British government responded to the Food Advisory Committee's review of food labelling practices. Based on the recommendations Buckley & Shepherd (1993) reviewed ergonomic studies of information presentation in a number of fields leading to the development of specific guidelines as to: character size; orientation; pack information load; typography; leading; spacing; brightness; location of information; and use of shaped information (see Attachment IV).

Summary

The recommendations provided by the three different authors (Buckley & Shepherd 1993; Food Standards Agency 2008; ISMP 2013) all present similar factors. Those issued by the Food Standards Agency (2008) are the most comprehensive and relevant to the design of food labels, however these could be extended by including elements from the Buckley & Shepherd (1993) and ISMP (2013) recommendations. Table 5 presents the original Food Standards Agency (2008) table with additional recommendations from the Institute for Safe Medication Practices (2013) and Buckley & Shepherd (1993) highlighted in red.

Table 5 Label recommendations from the UK Food Standards Agency (Food Standards Agency 1008) with additional recommendations from ISMP (2013) and Buckley & Shepherd (1993) highlighted in red

	Best Practice Advice		
	Recommended	To be used with care	Best avoided
Font type and format	<ul style="list-style-type: none"> • Open fonts such as Arial for letters • Bold type if print quality is retained • Minimum font size of 8-point* if contrast, text format and print quality is a high standard. If they are not of a high standard a larger font size should be used • Use numbers instead of alphabetic characters (ISMP 2013). 	<ul style="list-style-type: none"> • Bold type • Uppercase letters • Underlining • Hyphenation • Justified text • Coloured text/backgrounds • Where space is limited at least the name of the food, the date mark, list of ingredients and allergen information should be listed in 10-point, with a minimum of size 6-point used for other information 	<ul style="list-style-type: none"> • Ornate fonts • Shadowing • Italics
Contrast	<ul style="list-style-type: none"> • Black type on a white background or good tonal contrast of at least 70% 	<ul style="list-style-type: none"> • Light type on a dark background • Where packaging is transparent, good contrast is necessary with food product forming the visible background • Watermarking or non-solid background (e.g. dot filled background) where text appears 	<ul style="list-style-type: none"> • Dark type on a dark background • Light type on a light background • Green/red or yellow/white combinations
Layout	<ul style="list-style-type: none"> • Text that starts from and is aligned with the left margin • Horizontally printed wording rather than vertically printed wording (Buckley & Shepherd 1993) • Maximise the amount of white space while managing the readability of the text (ISMP 2013) • Thicker, denser line letters make text easier to read (ISMP 2013) • Group text into separate, conceptually-related sections to facilitate searching and acquisition of information (ISMP 2013) • If a voluntary allergen box is included it should be in the same field of vision as the ingredients list (Food Standards Agency 2008). 	<ul style="list-style-type: none"> • Text wrapping 	
Surfaces	<ul style="list-style-type: none"> • Matt finish printing surface 		<ul style="list-style-type: none"> • Metallic and shiny surfaces • Rough surfaces
Shapes	<ul style="list-style-type: none"> • No more than five geometric shapes and no more than nine colour combinations of hue, brightness and saturation on any one label (Buckley & Shepherd 1993) 		

	<ul style="list-style-type: none"> Use a standard icon system for signalling and organising auxiliary warnings and instructions (ISMP 2013) 		
Terminology	<ul style="list-style-type: none"> Simplify the language, avoiding unfamiliar terms (ISMP 2013) When using voluntary allergen boxes the name of the allergen that must legally appear in the ingredients list should be included, i.e. 'milk' not 'casein' (Food Standards Agency 2008). 		

Note. *Different fonts can have different character heights. These recommendations are based on an 8-point font size having the lower case letter 'o' with a height of 1.6mm.

As they are presented, these recommendations are limited in their ability to apply the Attention, Knowledge and Compliance model because they do not distinguish between attention and knowledge acquisition, although they are based on empirical findings that provide evidence for compliance.

4.3 LABEL FORMAT

The recommendations on the format of food labelling presented in the previous section do not distinguish between factors that gain attention and assist knowledge acquisition. There is however, some evidence of compliance (the impact of the factors on consumer behaviour) because the recommendations are predominantly based on empirical findings. This section will provide an overview of the literature available on format and presentation factors that gain attention, aid knowledge acquisition and achieve compliance. The review was focused on the format of all mandatory label information; however the majority of articles examining format were related to a small number of mandatory items: mandatory warning and advisory statements and declarations; labelling of ingredients; and nutrition information.

When talking about the factors that impact on how people process information there appeared to be a lot of overlap between content and format. Many articles did not distinguish these concepts; instead a more global perspective of food labels was taken which viewed content and format together. This was a complexity of the review and findings on format in isolation are presented wherever possible.

This section presents the factors that have been reported to gain people's attention, followed by those factors which impact on knowledge acquisition. Within each of these sections evidence of how these factors impact on behaviour (compliance) are included.

4.3.1 Attention

A number of variables were identified in the literature as impacting on whether a consumer's attention is attracted to a label. A majority of this information emerged from the literature on cigarette packaging and the design of warnings, rather than from food labelling. However, the principles used in each of these instances are likely to be similar and are worthy of further investigation to determine their relevance in food labelling. The variables identified were grouped into the following six factors that attract attention: the shape of the area containing the information; the location of information; the size of the information; the use of colours and symbols; the direction of text; and the use of signal words (see Table 6). Varying levels of evidence exist for each of the factors. Factors have been highlighted in yellow if there is evidence for their ability to impact on attention, not simply a finding that consumers prefer a particular design feature.

Table 6 Factors that gain attention (those highlighted in yellow have evidence for their impact on attention)

Factors	Variables that gain attention	Compliance/Evidence for inclusion as a factor
The shape of the area containing the information	<ul style="list-style-type: none"> Shapes that have been shown to increase noticeability of information include: <ul style="list-style-type: none"> An octagon and a circle with an arrow pointing into it; 	A study of cigarette advertising found that this shape ranked highest among shapes for warning noticeability (Rogers et al. 2000).
	<ul style="list-style-type: none"> An equilateral triangle with a downward point; A diamond; A hexagon; Equilateral triangles pointing up and to the right (Rogers et al. 2000). 	A study of 19 shapes, in the context of warning signs, found the equilateral triangle with a downward point to be the most likely to attract attention, with the diamond, hexagon and equilateral triangles pointing up and to the right also ranking high (Rogers et al. 2000).
The location of information	<ul style="list-style-type: none"> Include important information on the front of products (Campos et al. 2011; Hellier et al. 2006; Kalsher et al. 1996; Rogers et al. 2000; Spink et al. 2011; Stuart 2010). 	Consumers are more likely to look at information if it is on the front of the package rather than on the back or side (Campos et al. 2011; Spink et al. 2011), or if it is attached as a tag that does not need to be unfolded (Hellier et al. 2006; Kalsher et al. 1996; Rogers et al. 2000). Therefore consumers may be less likely to see mandatory information that is placed at the side or rear of a package in a visual plane not immediately accessible at the point of purchase (Stuart 2010).
	<ul style="list-style-type: none"> Include important information attached as a tag (Hellier et al. 2006; Kalsher et al. 1996; Rogers et al. 2000). 	
	<ul style="list-style-type: none"> Labels that require interactivity, e.g. the label is taped across the opening of the product (Hellier et al. 2006; Rogers et al. 2000). 	Labels, in the context of warnings and medication labels, are more noticeable if they require interactivity with the warning, e.g. have the label taped across the opening (Hellier et al. 2006; Rogers et al. 2000).
The size of the information	<ul style="list-style-type: none"> Increase the size of warnings (Barlow and Wolgater 1991, cited in Rogers et al. 2000). 	Barlow and Wogalter (1991) cited in Rogers et al. (2000) found that increasing the size of a product label that contained information about product use, directions and warnings by 20% increased the perceived noticeability of the warning. However, the size of the control label was not specified limiting the usability of this finding.
	<ul style="list-style-type: none"> Reduce the information surrounding the message (Rogers et al. 2000). 	Warnings were found to be more noticeable when information surrounding the message was reduced (Rogers et al. 2000). However, the volume of information included on the labels for this comparison was not specified.

Factors	Variables that gain attention	Compliance/Evidence for inclusion as a factor
	<ul style="list-style-type: none"> • For warnings on tobacco in Canada formatting rules stated that: <ul style="list-style-type: none"> ○ “The type size of the text of the warning or message accounts for not less than 70 per cent of the area in which it is displayed ○ The text of the warning or message is centred within the area in which it is displayed ○ The text of each message is displayed within an area that occupies not less than 20 per cent of each of the two largest principal display surfaces of the package”. <p>(Crane & MacLean 1996, p50)</p> <ul style="list-style-type: none"> • Increase the amount of label space on food given to mandatory information so that it is comparable in size and prominence to commercial information. On average mandatory information accounts for less than 8% of the overall space, whereas commercial information covers an average of 25% of the surface (Stuart 2010). 	<p>It was not stated whether these guidelines achieved the desired behaviours.</p> <p>It was not stated in the literature whether increasing the space afforded to mandatory information would impact on gaining attention or understanding the information presented on labels. It was discussed however that on average mandatory information accounts for less than 8% of the overall space on food labels, whereas commercial information covers an average of 25% of the surface (Stuart 2010). The comparative size and prominence between mandatory and commercial information may impact on implied importance and the value to the decision making process. Increasing the space allocated to mandatory information may enhance readability for consumers who have problems with their vision and assist in gaining attention (Stuart 2010).</p>
The use of colours and symbols	<ul style="list-style-type: none"> • The use of pictorials (Rogers et al. 2000). • Increase the visual salience (ability of the nutrition label to grab attention), e.g. by using contrast (Graham et al. 2012). 	<p>Participants have been shown to identify the presence of a warning with pictorials quicker than warnings without pictorials (Rogers et al. 2000).</p> <p>Studies using eye-tracking research (Graham et al. 2012) suggest that the visual salience of a label can be increased by modifying the colours used and contrast, as well as by using anchor lines on the label.</p>
The direction of text	<ul style="list-style-type: none"> • Text to be printed horizontally rather than vertically (Rogers et al. 2000). 	<p>Labels printed horizontally are more noticeable compared to those printed vertically (Rogers et al. 2000).</p>
The use of signal words	<ul style="list-style-type: none"> • Use of a signal word to attract attention, e.g. danger, warning, caution (Hellier et al. 2006; Rogers et al. 2000). 	<p>In the context of warning labels, the word ‘danger’ has been rated as more likely to attract attention than the word ‘caution’ (Hellier et al. 2006; Rogers et al. 2000).</p>

4.3.2 Knowledge

Poor presentation, legibility and difficult to find information can result in people not interpreting and effectively using labels. Therefore it is important to consider the factors that impact on knowledge acquisition.

In addition, when designing labels and considering how each of these factors will be addressed it is important to understand the task that is desired of consumers, i.e. do consumers need to look at individual pieces of information or do they need to compare multiple pieces of information (Marino & Mahan 2005) individual items or looking across multiple items (comparison across items) (Marino & Mahan 2005). The most useful format will vary depending on the task required, e.g. if comparisons are required information should be included clearly next to each other in a format that can easily be compared.

The literature also identifies certain audiences (e.g. older people, people with low literacy, people with disabilities, people who are culturally and linguistically diverse and Indigenous populations) as having issues in relation to the accessibility and legibility of labels. These articles generally indicate that certain population sub-groups have difficulty reading labels and state that they need to be simplified. However, no studies provide specific examples on optimal label presentation specifically for these sub-groups (e.g. specific font sizes or types of graphics that can be used apart from traffic lights for front of package labelling).

Factors that were identified as impacting on knowledge acquisition were grouped into the following three categories: how the information is displayed; style; and trustworthiness (see Table 7). Varying levels of evidence exist for each of the factors. Factors have been highlighted in yellow if there is evidence for their ability to impact on knowledge and assist consumers to understand the information presented, not simply a finding that consumers prefer a particular design feature.

Table 7 Factors that impact on knowledge acquisition (those highlighted in yellow have evidence for their impact on knowledge acquisition)

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
HOW THE INFORMATION IS DISPLAYED		
The inclusion of graphics	<ul style="list-style-type: none"> Whether information should be presented as a symbol or text depends somewhat on the type of information. For example, an ingredients list can only be in text but symbols may work well for allergen information. 	Differentiating nutrition-related decision-making tasks and nutrition label formats on the basis of their task proximity and display proximity and display proximity, respectively, can provide a meaningful way to specify the primary characteristics that need to be evaluated experimentally to support the selection of an efficient, useful nutrition label (Marino & Mahan 2005).
	<ul style="list-style-type: none"> Upward and rounded designs, as well as right-aligned graphics (Westerman et al. 2013). 	It is not stated in the literature whether these design factors are effective in conveying information on labels; the recommendation of this factor is based on the described preferences of respondents (Westerman et al. 2013). The study by Westerman et al. (2013) determined preferences by showing respondents eight different label designs (for water and vodka) and asking them to rate nine items on a five point scale ranging from 'definitely' to 'definitely not', e.g. "I would purchase this product", or "this design is visually appealing" (Westerman et al. 2013).
	<ul style="list-style-type: none"> The use of short instructions, icons and explanation of why it is important to follow the instructions to convey safe handling instructions for food (Teague & Anderson 1995). 	Similar to the previous factor these design considerations are based on preferences. Respondents were provided with six different label designs (for meat and poultry) and were asked to select which one's they preferred, indicating that they prefer labels that display short instructions, icons and explanation of why it is important to follow the instructions (Teague & Anderson 1995). It is not reported if these design considerations result in improved safety behaviours.
	<ul style="list-style-type: none"> The use of unambiguous symbols (Cornelisse-Vermaat et al. 2008; Navai et al. 2001). 	<p>Two studies, one drawing on preference and one examining the level of understanding, explored whether the inclusion of symbols assisted consumers to understand the labels. Cornelisse-Vermaat et al. (2008) interviewed consumers while they were shopping and asked them about their view on the inclusion of a symbol to convey allergen information. Respondents reported that at face value the inclusion of a symbol is useful but it is crucial that their meaning is clear (Cornelisse-Vermaat et al. 2008). For example, respondents were unsure as to whether the inclusion of a specific allergen symbol indicated that the food did or did not contain the allergen.</p> <p>Similarly, a study by Navai et al. (2001) that examined respondents' understanding of symbols on medication labels reported some confusion. For example, a medication packet included the picture of a sun on a black background. This created confusion for consumers because they were unsure if it was referring to day or night and they were therefore unsure of when the medication should be taken (Navai et al. 2001).</p> <p>Semiotics is about understanding how signs produce meaning and could be used to develop symbols to use and food labels, while ensuring that the intended meaning is understandable and identifiable by all consumers (Piqueras-Fizman, Ares & Delzie 2010).</p>

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
	<ul style="list-style-type: none"> Nutrition labels that use graphics, symbols, adjective labels and include minimal numerical content (Campos et al. 2011; Kapsak et al. 2008). 	<p>Nutrition information panels using graphics, symbols, adjective labels and labels with minimal numerical content have been shown to be more effective in assisting people to identify products with higher nutritional content than nutrition labels that only include quantitative information (Campos et al. 2011; Kapsak et al. 2008). For example, graphically including a reference point as part of the nutrition information panel so that consumers can evaluate the nutritional content of the food, e.g. including an arrow that indicates at how healthy all sorts of chocolate bars are and how health that specific chocolate bar is (see Attachment X).</p>
The use of tables	<ul style="list-style-type: none"> The use of tables simplifies the presentation of information (Ares et al. 2012). 	<p>A study by Ares et al. (2012) reported that respondents are quicker to identify nutrition information and classify the product according to specific nutrient content when information is presented in a table rather than text (Ares et al. 2012).</p>
The order in which information is presented	<ul style="list-style-type: none"> Nutrients positioned according to health relevance, with the more relevant at the top of the label (Graham et al. 2012). 	<p>A review of eye tracking studies suggests that nutrients located nearer to the top of the label receive more visual attention from consumers (Graham et al. 2012).</p>
The amount of information on the label	<ul style="list-style-type: none"> Reduce visual clutter (the number of components on the label) (Graham et al. 2012). 	<p>Studies using eye-tracking research (Graham et al. 2012) suggest that as the number of components included on a food label increases, the amount of time spent looking at any single component decreases. Therefore, decreasing the attention paid to the nutrition panel. Thus reducing the number of components on the label may increase the amount of time consumers spend looking at the nutrition panel (Graham et al. 2012).</p>
	<ul style="list-style-type: none"> Reduce the amount of information on labels (Cornelisse-Vermaat et al. 2008; Spink et al. 2011). 	<p>Several studies provide evidence to support the relevance of this design factor, based on preference and consumer behavior. A study by Cornelisse-Vermaat et al. (2008) interviewed consumers while they were shopping and found that consumers think that labels are overloaded with information which makes information on allergens difficult to find. Spink et al.'s (2011) review of the literature also found that too much information on the label could stop some consumers from reading it (Spink et al. 2011). However, 'too much information' is not quantified.</p> <p>A study that did quantify the amount of information included on the food label found that consumers were more willing to pay for a food product that included a medium rather than high amount of information (Kimura et al. 2008). In this study a label that included a small amount of information included only the name of the product and the content weight. In addition to this information a label with a medium amount of information included the ingredients and information about food allergens. Further information (descriptions of each ingredient and a production method for the product) was also included on food labels that were classified as including a large amount of information (Kimura et al. 2008).</p>
	<ul style="list-style-type: none"> Reduce the number of nutritional claims (Jacobs et al. 2011). 	<p>Jacobs et al. (2011) found that consumers reported the main reason for not reading food labels to be that there are too many nutritional claims included on products (Jacobs et al. 2011).</p>

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
The location of information	<ul style="list-style-type: none"> • Position nutrition labels centrally (Graham et al. 2012). 	Studies using eye-tracking report that consumers spend over 30% more time viewing nutrition labels located in the centre of a visual plane rather than the side of a visual plane. Although, another study reports that targets at the centre of the label (the most dense area) require 33% more time to find and were harder to find than targets at the top or bottom of the label (Goldberg et al. 1999).
	<ul style="list-style-type: none"> • The text of the message should not be altered in any way when the package is opened. This will ensure that the text can read even after the package is open (Crane & MacLean 1996). 	A review examining consumers' evaluation of warnings on cigarette packages proposed that the text of the message should not be altered in any way when the package is opened so that the text can always be read (Crane & MacLean 1996). However there is no evidence as to how this design factor may impact on consumer behavior.
	<ul style="list-style-type: none"> • Include the nutrition panel and list of ingredients together (Mackey & Metz 2009). 	In focus group discussions consumers reported that separating the nutrition panel from the list of ingredients makes decision making tedious (Mackey & Metz 2009).
	<ul style="list-style-type: none"> • Include a short claim on the front of the food package and more detailed instructions elsewhere on the outer package (Spink et al. 2011). 	A review of the literature by Spink et al. (2011) indicated that optimal message communication is provided when a short claim is provided on the front of a food package and more detailed instructions are available elsewhere on the outer package.
The location of allergen information	<ul style="list-style-type: none"> • Allergens should be listed in the ingredients list (Joshi et al. 2002). 	In a study by Joshi et al. (2002) parents overlooked a small label for 'trace peanuts' that was neither in the ingredients list nor next to the ingredients list.
	<ul style="list-style-type: none"> • Include specific allergy information above the ingredients list to avoid searching (Cornelisse-Vermaat et al. 2008). 	Consumers have reported that they would like specific allergy information included above the ingredients list to avoid searching for this information (Cornelisse-Vermaat et al. 2008). Beyond this stated preference however, the impact of this design factor on behaviour has not been examined.
The space allocated to mandatory information	<ul style="list-style-type: none"> • Give information about ingredients and additives more prominence on labels (Wright 1997). 	The respondents in Wright's (1997) survey felt that information about ingredients and additives should be given more prominence on food labels to ensure ease of reading and location of this information. However, there is no empirical evidence as to the effect this change would have on consumer behaviour.
The consistency with which information is presented across different labels	<ul style="list-style-type: none"> • Present information in a consistent location on all packages (Bauer & Guerlain 2011; Bettman 1986; Sharf et al. 2012; Wright 1997). 	Studies exist in which consumers report that the lack of uniformity in label formats across manufacturers makes it difficult to locate information (Bauer & Guerlain 2011; Sharf et al. 2012; Wright 1997). In addition, it has been proposed that if information were in a consistent location it would trigger memory when searching (Bettman 1986).

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
	<ul style="list-style-type: none"> Use a standardised approach to presenting allergy information or have a standardised symbol to indicate allergens (Voordouw et al. 2011). 	<p>Consumers in a study by Voordouw et al. (2011) supported the use of standardised allergy information or a standardised symbol indicating the allergens. A standardised approach is required to avoid consumers misinterpreting what the presence and absence of information/symbols means (Barnett et al. 2011). For example, allergy advice boxes are a trusted source of information but since the boxes are not mandatory there is a risk that consumers may think that no box means the absence of allergens.</p> <p>Joshi et al. (2002) found that not all parents of children with allergies are able to identify presences of the relevant allergen on all labels. Only 54% of parents of children who were allergic to nuts were able to correctly identify the inclusion of peanuts in five products, 7% of parents of children with milk allergies correctly identified its inclusion in 14 labels, 22% of parents of children allergic to soy protein identified its inclusion in 7 products, wheat was correctly identified by 88% of parents of allergic children on 10 labels and egg was identified by 93% of parents with allergic children on 7 labels (Joshi et al. 2002). Possible reasons for inaccuracies in identifying the relevant allergens include:</p> <ul style="list-style-type: none"> symbols were used in isolation on some food labels to indicate the presence of the allergen, i.e. a text warning was not included; 'trace peanuts' was not included in or near the main ingredient list; and parents were not aware that terms such as 'natural flavours' could indicate that milk is included in the product (Joshi et al. 2002).
	<ul style="list-style-type: none"> Use terminology that consumers are familiar with (Besler 2012). 	<p>There is a lot of unfamiliar terminology on labels (Baltas 2000; Cornelisse-Vermaat et al. 2008; Wright 1997). For example, in a study by Cornelisse-Vermaat et al. (2008) some consumers with allergies did not realise that 'whey powder' is the same as 'milk'. Misunderstandings such as this can be dangerous for people with allergies. In addition, studies by Besler et al. (2012) and Jacobs et al. (2011) reported that consumers list one of the main reasons for not reading food labels as not understanding the terms and values used. However, the specific terms that participants found difficult to understand were not explored.</p>
Difficulty interpreting numbers on the nutrition panel	<ul style="list-style-type: none"> Use rounded numbers rather than decimals (Cuk 2009). 	<p>A review by Cuk (2009) reported that rounded numbers are simpler to interpret than decimals on the nutrition panel (Cuk 2009).</p>
	<ul style="list-style-type: none"> Use non-numerical descriptions on the nutritional panel (Burton et al. 2004, Cowburn & Stockley 2005). For example, specifying whether the fat, salt or protein levels in the product are high or low. 	<p>Studies have shown that the use of non-numerical descriptions aids the interpretation of information on the nutritional panel (Burton et al. 2004, Cowburn & Stockley 2005). For example, specifying whether the fat, salt or protein levels in the product are high or low. In contrast however, another study found that consumers prefer the nutritional information panel to be in a numerical format (Lewis et al. 1992).</p>
	<ul style="list-style-type: none"> On the nutrition information panel display nutrient amounts in percentages rather than in metric units (Levy et al. 1996). 	<p>Consumers are able to more effectively interpret nutrition information panels that display nutrient amounts in percentages than for those that display nutrient amounts in metric units (Levy et al. 1996).</p>

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
The use of alternative methods for delivering information	<ul style="list-style-type: none"> <li data-bbox="450 225 949 272">• The use of technology to provide detailed food safety information (Voordouw 2011). 	<p data-bbox="972 225 2051 325">Consumers liked an ICT-solution where they used a device to show them the percentage of all ingredients, 'may-contain' warning and a glossary, as well as provide them with audio and visual warnings (Voordouw 2011). Such an approach has the benefit of being able to personalise information on the device (Voordouw et al. 2011).</p> <p data-bbox="972 357 2051 560">Task based interface (TBI) is a human-computer interface design (Dunbar 2010). Dunbar (2010) found that tailoring information to consumers using TBI improves effectiveness of labels. TBI can be accessed through mobile technologies, such as a smartphone, by scanning a label on the shelf or product. The nutritional information could then be presented on the screen of the smartphone or through its speaker (Dunbar 2010). This approach allows consumers to personalise the information they receive and addresses the difficulty of including all nutritional requirements on one label (Dunbar 2010). However, this approach may not suit consumers who do not have access to this type of technology.</p> <p data-bbox="972 592 2051 715">Bedi et al. (2010) examined the use of the 'healthy shelf' – an interactive shelf for nutrition label information that provides serving size adjustment, calorie diet adjustment, explanation of nutrients, the ability to drill down for additional nutritional content and comparison of products (Bedi et al. 2010). This study showed that that consumers made fewer incorrect choices in terms of the nutritional quality of the food when using 'the shelf'.</p> <p data-bbox="972 746 2051 895">A study by Voordouw et al. (2012) compared the use of labels, booklets and electronic scanners for providing consumers with information on allergens. The label and scanner were rated high in terms of functionality but consumers were confident that all the modes provided accurate allergy information. Consumers indicated that the label was the most functional source of allergen information, suggesting that they may have found the use of the scanner or booklet time consuming (Voordouw et al. 2012).</p>
	<ul style="list-style-type: none"> <li data-bbox="450 903 949 951">• Use of a labelling system (Bettman et al. 1986) 	Bettman et al. (1986) proposed the use of a labelling system using four different modes of communication (advertisements, point of purchase displays, labels and packaging inserts) to combine to achieve the desired outcome prior and during purchase and when product is in use.
STYLE		
The use of lines	<ul style="list-style-type: none"> <li data-bbox="450 1061 949 1204">• Thinner lines (1/4 point) between pieces of information on the nutrition panel (Goldberg et al. 1999) or grey shading to divide sections of the food label or nutrition information panel (Institute of Safe Medical Practice Guidelines 2009, cited in Bauer & Guerlain 2011). 	Thinner lines (1/4 point) between pieces of information on the nutrition panel resulted in quicker search times than thicker lines (3 point) (Goldberg et al. 1999). The Institute of Safe Medical Practice Guidelines (2009, cited in Bauer & Guerlain 2011) recommends the use of grey shading to divide sections of drug label and semantically divide information.
The use of colours	<ul style="list-style-type: none"> <li data-bbox="450 1214 949 1334">• There are different opinions on the colours that should be used on labels. Some studies say colour is better, whereas others say that black text on white background is better (Braun et al. 1995; Rogers et al. 	There are different opinions on the colours that should be used on labels. One study says that colour labels are perceived to indicate hazards and are more readable than black and white labels (Braun et al. 1995). Whereas another study says that black text on white background is easier to read (Rogers et al. 2000).

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
	2000).	
	<ul style="list-style-type: none"> • Avoid glossy/shiny labels (Cornelisse-Vermaat et al. 2008). 	In a study by Cornelisse-Vermaat et al. (2008) consumers reported that glossy/shiny labels make food labels difficult to read.
	<ul style="list-style-type: none"> • Ensure optimal contrast between the text and background (Cornelisse-Vermaat et al. 2008). 	Consumers reported that food labels could be difficult to read because the contrast between the text and background is not always optimal (Cornelisse-Vermaat et al. 2008).
	<ul style="list-style-type: none"> • Ensure that critical information on labels is conveyed not only in colour, but also in text (Kaufman-Scarborough 2000). 	It is important to ensure that critical information on labels is conveyed not only in colour, but also in text, for people who are colour deficient (Kaufman-Scarborough 2000).
	<ul style="list-style-type: none"> • Use red and the octagon shape to indicate hazards (Braun et al. 1995). 	The combination of red and the octagon shape produces the highest rating of hazards (Braun et al. 1995).
	<ul style="list-style-type: none"> • Colour labels (Braun et al. 1995). 	In the context of warning labels, colour labels were perceived to indicate hazards and be more readable than black and white labels (Braun et al. 1995).
	<ul style="list-style-type: none"> • The combination of red and the octagon shape (Braun et al. 1995; Hellier et al. 2006). 	The combination of red and the octagon shape produces the highest rating of hazards when examining a range of warning labels (Braun et al. 1995; Hellier et al. 2006).
Fonts used	<ul style="list-style-type: none"> • Bigger font size is needed (Cornelisse-Vermaat et al. 2008; Singla 2010; Wright 1997). There are varying recommendations for the exact size, 10-point size (Silver and Braun 1993) or 12-point size and this will in part depend of the level of importance of the information (Institute of Safe Medical Practice Guidelines 2009, cited in Bauer & Guerlain 2011). 	<p>A number of studies identified that the font size used on labels needs to be bigger (Cornelisse-Vermaat et al. 2008; Singla 2010) because small print makes it difficult to read and is a reason that consumers give for not reading labels (Jacobs et al. 2011; Wright 1997). However, these studies do not suggest what size font would be optimal. In a study of warning labels on dishwashing detergent consumers reported greater perceived readability of the warning when the main body was printed in a 10-point size when compared to 8-point size (Silver and Braun 1993).</p> <p>Recommendations from the Institute of Safe Medical Practice Guidelines (2009, cited in Bauer & Guerlain 2011) state that 12-point font should be used for key information (patient's name, generic drug name and dose), whereas other less pertinent information (patient identifiers, drug concentration) should be in 10-point font.</p>
	<ul style="list-style-type: none"> • Avoid the use of all upper case letters (Bauer & Guerlain 2011). 	All upper case text has been found to be difficult to read on medication labels (Bauer & Guerlain 2011).

Factor	Variables that aid knowledge acquisition	Compliance/Evidence for inclusion as a factor
	<ul style="list-style-type: none"> • Use TALL man lettering (Hellier et al. 2006). 	Hellier et al. (2006) found that TALL man lettering improved consumers' ability to identify medications.
	<ul style="list-style-type: none"> • Use a sans serif font such as Helvetica type rather than Times or Goudy for key information (Institute of Safe Medical Practice Guidelines 2009, cited in Bauer & Guerlain 2011; Silver & Braun 1993). 	A study of dishwashing detergent found that consumers perceived Helvetica type to be more readable than Times or Goudy (Silver & Braun 1993). Recommendations from the Institute of Safe Medical Practice Guidelines (2009, cited in Bauer & Guerlain 2011) state that sans serif font should be used for key information (patient's name, generic drug name and dose), whereas other less pertinent information (patient identifiers, drug concentration) should be in serif font.
	<ul style="list-style-type: none"> • Use bold font rather than unbolded font (Silver & Braun 1993). 	A study of dishwashing detergent found that consumers perceived bolded type to be more readable than type that was not emphasized in this way (Silver & Braun 1993). Recommendations from the Institute of Safe Medical Practice Guidelines (2009, cited in Bauer & Guerlain 2011) state that bold font should be used for key information (patient's name, generic drug name and dose), whereas other less pertinent information (patient identifiers, drug concentration) should be unbolded.
Presentation of text	<ul style="list-style-type: none"> • Avoid having text blocks at right angles to each other (Mackey & Metz 2009). 	Mackey and Metz (2009) found that printing text blocks on labels at right angles to each other makes it difficult to compare the information displayed (Mackey & Metz 2009).
	<ul style="list-style-type: none"> • Avoid print that curves around a container (Mackey & Metz 2009). 	A study by Mackey & Metz (2007) found print that curves around a package to be difficult to read (Mackey & Metz 2009).
	<ul style="list-style-type: none"> • Avoid placing words over illustrations, having busy backgrounds or watermarks (Mackey & Metz 2009). 	Words placed over illustrations, busy backgrounds or watermarks are difficult to read (Mackey & Metz 2009).
	<ul style="list-style-type: none"> • Include adequate spacing between lines of print (Mackey & Metz 2009). 	Consumers reported that they would like there to be more space between lines on food labels as this would make the labels easier to read There needs to be adequate (Mackey & Metz 2009). However, this study did not indicate what the size of the space should be.
TRUSTWORTHINESS		
The trustworthiness of the information presented	<ul style="list-style-type: none"> • Include quantitative information on nutritional panels (Fellers & Findley 2007). 	A study by Fellers & Findley (2007) found that quantitative information on nutritional panels increases consumers' belief in the nutritional value of the food and its economic worth, as well as trust in the manufacturer.

4.4 IMPACT OF A LOSS OF INFORMATION

Scant literature was available on the impact that having two versus one column of information on the nutrition information panel will have on the format of labels. The studies located found the dual column format to be more effective than single column formats to help consumers make healthier food choices (Lando & Lo 2013) and for non-dieters to consume less (Antonuk & Block 2006). Consumers have also reported dual columns to be more useful than single columns (Campos et al. 2011). The remaining studies focused on the content, for example, the effectiveness of including on the nutrition information panel data per serving size or container sizes, daily values and reference portion size labelling to assist consumers to make healthier choices (Besler et al. 2012; Campos et al. 2010; Rothman et al. 2006; Soulden et al. 2012; Vanderlee et al. 2012; Vermeer et al. 2010). No studies were located discussing the dual versus single column in relation to information density, amount of information or loss aversion.

4.5 WHAT IS THE IMPACT OF MANDATED VERSUS VOLUNTARY INFORMATION?

Mandatory information on labels competes for attention from consumers with many other stimuli, such as advertising and general health guidelines consumers receive from television, government, nutritionists and friends (Caswell 1992). However, a study by Aygen (2012) found that the first five pieces of information that consumers look at on food labels are mandatory: expiration date; production date; shelf life; name and brand of product; and ingredients.

In addition, limited information emerged as to the factors influencing the credibility of labels. This information included a report by the European Food Information Council (2005) that identified that consumers draw a distinction between objective facts (e.g. calories) and marketing claims ('can help lose weight'), but certain brands or products (e.g. those with a 'light' or 'low fat' claim) are viewed intrinsically as healthy and the nutritional value is not questioned (Drichoutis et al. 2006). This is demonstrated by the finding that voluntary health claims on unhealthy products increases consumer's consideration of the product, for example the statement 'low fat' on lollies (Barreiro-Hurle 2010).

Given the limited information available exploring how people respond to mandatory versus voluntary information and the perceived credibility of labels, more research is warranted to understand the trust that consumers place on non-mandated and mandated label information.

5 Gaps in the literature

A large number of the studies reviewed were limited in that they used a questionnaire to assess either self-reported use of labels or ability to use labels, rather than examining actual use of labels in the natural context (the supermarket). There were also differences in the way in which articles defined 'use of labels'. In addition the articles identified that consumers have difficulty using labels for varying reasons (e.g. low literacy, or culturally and linguistically diverse) and that they need to be made simpler, but there are few specific recommendations about how this can be enacted.

In addition, many of the studies examining 'use' of labels measured self-reported use in a survey by asking consumers whether they could locate nutrition information on a label and choose the product with the higher nutritional content. However, such studies do not take into account how consumers behave when they are actually shopping in the real world environment where people are busy and have competing stimuli. In these environments the features that gain attention, support knowledge acquisition and result

in compliance may differ to self-reported use in a survey. Well-designed realistic computer simulation studies (e.g. shopping in the virtual supermarket, or eye tracking studies of attention to label components) may provide an inexpensive option for evaluating key aspects of label design.

Two studies were identified using the current search criteria that highlighted the gap between people's knowledge about what they need to do to keep healthy (i.e. read labels) and how they behave (i.e. the products they purchase) (Barker et al. 2012; Borra 2006). Further, Cowburn & Stockley (2005) and Mhurchu & Gorton (2007) suggest that actual-use of labels while shopping is low. These findings suggest that a) consumers choose not to read labels when they are shopping and b) that even though consumers may read the label and realise that it is healthier they may decide not to buy it based on other factors such as price taste or habitual buying. These are important factors to consider when investigating the use of labels and which formats are associated with consumer behaviour. To account for the limitations of self-reported use more studies need to examine actual-use of labels in the natural environment (the supermarket).

6 Summary of findings

The review findings and their relevance are summarised below in relation to the five objectives.

Objectives 1 and 2

- **To identify the psychological, consumer behaviour and human factors and ergonomic models, conceptual frameworks and theories best suited to conceptualise the communication of mandated food label information to purchasers and consumers of packaged food products.**
- **To define and articulate key concepts used in the models, frameworks and theories, including: attention, accessibility, credibility, legibility, comprehension, understanding, use and effectiveness.**

This literature review has summarised models available for conceptualising the design of labels deeming the Attention, Knowledge and Compliance (AKC) model to be most relevant.

Objective 3

- **To identify (i) how the Perceptible Information Principle could and has been used to maximise food label comprehension across a wide range of consumers; and (ii) what other tools could provide similar guidance – including whether the presentation of information in multiple modes is required.**

Tools available to assist in operationalising the above models, including the PIP, were explored. No literature was located on the use of the PIP in labelling; however, several recommendations were located in relation to food and medication labelling (Bukley & Shepherd 1993; Food Standards Agency 2008; ISMP 2013).

The recommendations by the Food Standards Agency (2008) were the most comprehensive and relevant to food labelling and we have suggested that these be extended by also including specific recommendations from ISMP (2013) and Buckley & Shepherd (1993). This results in a tool which considers the factors of: font type and format; contrast; layout; surfaces; shapes and terminology. The recommendations do not distinguish between attention and knowledge acquisition, however, the elements of the tools were applied where appropriate within the broader findings and structure of the literature review.

Objective 4

- **To identify (i) how the format (e.g. font, colour, contrast, position, bolding, amount of information, use of lines/columns/tables, and consistency across packaging) of mandated food label information impacts on consumers' and purchasers' attention, accessibility, credibility, legibility, comprehension, understanding, use and effectiveness and (ii) the relative importance of various aspects of label element format.**

All studies identified in the search were reviewed to identify how the format of mandatory information on food labels impacts on attention and knowledge acquisition, as well as compliance. The factors that gain attention and support knowledge acquisition are presented in Table 8 and

Table 9 respectively. These tables include those factors recommended by the Food Standards Agency (2008), ISMP (2013) and Buckley & Shepherd (1993). Details on compliance (how the factor impacts on consumer behaviour) have not been included in these tables but are included in Table 6 and Table 7 in sections 4.3.1 and 4.3.2. No evidence was found describing the relative importance of each of the factors. However, those variables that have been highlighted in yellow have evidence for their ability to impact on attention or knowledge acquisition, not simply a finding that consumers prefer a particular design feature.

Table 8 Factors and variables that gain attention (those highlighted in yellow have evidence for their impact on attention)

Factors	Variables that gain attention
The shape of the area containing the information	<ul style="list-style-type: none"> • An octagon and a circle with an arrow pointing into it. • An equilateral triangle with a downward point. • A diamond. • A hexagon. • Equilateral triangles pointing up and to the right.
The location of information	<ul style="list-style-type: none"> • Include important information on the front of products. • Information attached as a tag. • Labels that require interactivity, e.g. the label is taped across the opening of the product.
The size of the information	<ul style="list-style-type: none"> • Increase the size of warnings. • Reduce the information surrounding the message. • For warnings on tobacco in Canada formatting rules stated that: <ul style="list-style-type: none"> – “The type size of the text of the warning or message accounts for not less than 70 per cent of the area in which it is displayed. – The text of the warning or message is centred within the area in which it is displayed. – The text of each message is displayed within an area that occupies not less than 20 per cent of each of the two largest principal display surfaces of the package”. (Crane & MacLean 1996, p50) • Increase the amount of label space on food given to mandatory information so that it is comparable in size and prominence to commercial information.
The use of colours and symbols	<ul style="list-style-type: none"> • The use of pictorials. • Increase the visual salience (ability of the nutrition label to grab attention), e.g. by using contrast.
The direction of text	<ul style="list-style-type: none"> • Text to be printed horizontally rather than vertically.
The use of signal words	<ul style="list-style-type: none"> • Use of a signal word to attract attention, e.g. danger, warning, caution.

Table 9 Factors and variables that aid knowledge acquisition (those highlighted in yellow have evidence for their impact on knowledge acquisition)

Factor	Variables that aid knowledge acquisition
HOW THE INFORMATION IS DISPLAYED	
The inclusion of graphics	<ul style="list-style-type: none"> Whether information should be presented as a symbol or text depends somewhat on the type of information. For example, an ingredients list can only be in text but symbols may work well for allergen information. Upward and rounded designs, as well as right-aligned graphics. The use of short instructions, icons and explanation of why it is important to follow the instructions to convey safe handling instructions for food. The use of unambiguous symbols. Nutrition labels that use graphics, symbols, adjective labels and include minimal numerical content. No more than five geometric shapes and no more than nine colour combinations of hue, brightness and saturation on any one label. There needs to a standard icon system.
The use of tables	<ul style="list-style-type: none"> The use of tables simplifies the presentation of information.
The order in which information is presented	<ul style="list-style-type: none"> Nutrients positioned according to health relevance, with the more relevant at the top of the label.
The amount of information on the label	<ul style="list-style-type: none"> Reduce visual clutter (the number of components on the label). Reduce the amount of information on labels. Reduce the number of nutritional claims. Maximise the amount of white space while managing the readability of the text.
The location of information	<ul style="list-style-type: none"> Position nutrition labels centrally. The text of the message should not be altered in any way when the package is opened. This will ensure that the text can read even after the package is open. Include the nutrition panel and list of ingredients together. Include a short claim on the front of the food package and more detailed instructions elsewhere on the outer package. Group text into separate, conceptually related sections to facilitate searching and acquisition of information.
The location of allergen information	<ul style="list-style-type: none"> Allergens should be listed in the ingredients list. Include specific allergy information above the ingredients list to avoid searching.
The space allocated to mandatory information	<ul style="list-style-type: none"> Give information about ingredients and additives more prominence on labels.
The consistency with which information is presented across different labels	<ul style="list-style-type: none"> Present information in a consistent location on all packages. Use a standardised approach to presenting allergy information or have a standardised symbol to indicate allergens. Use terminology that consumers are familiar with.
Difficulty interpreting numbers on the nutrition panel	<ul style="list-style-type: none"> Use rounded numbers rather than decimals. Use non-numerical descriptions on the nutritional panel. For example, specifying whether the fat, salt or protein levels in the product are high or low. On the nutrition information panel display nutrient amounts in percentages rather than in metric units.
The use of alternative methods for delivering information	<ul style="list-style-type: none"> The use of technology to provide detailed food safety information. Use of a labelling system.
STYLE	
The use of lines	<ul style="list-style-type: none"> Thinner lines (1/4 point) between pieces of information on the nutrition panel or grey shading to divide sections of the food label or nutrition information panel.
The use of colours	<ul style="list-style-type: none"> There are different opinions on the colours that should be used on labels. Some studies say colour is better, whereas others say that black text on white background is better. Avoid glossy/shiny labels. Use black type on a white background or good tonal contrast of at least 70%. Ensure optimal contrast between the text and background. Ensure that critical information on labels is conveyed not only in colour, but also in text. Use red and the octagon shape to indicate hazards. Colour labels.

Factor	Variables that aid knowledge acquisition
	<ul style="list-style-type: none"> • The combination of red and the octagon shape.
Fonts used	<ul style="list-style-type: none"> • Bigger font size is needed. There are varying recommendations for the exact size (e.g. either 10-point size or 12-point size) and this will in part depend of the level of importance of the information. • Avoid the use of all upper case letters. • Use TALL man lettering. • Use a sans serif font such as Helvetica type rather than Times or Goudy for key information. • Use bold font rather than unbolded font, as long as the print quality is high.
Presentation of text	<ul style="list-style-type: none"> • Avoid having text blocks at right angles to each other. • Avoid print that curves around a container. • Avoid placing words over illustrations, having busy backgrounds or watermarks. • Include adequate spacing between lines of print. • Left aligned text. • Text printed horizontally rather than vertically.
TRUSTWORTHINESS	
The trustworthiness of the information presented	<ul style="list-style-type: none"> • Include quantitative information on nutritional panels.

Similar to the recommendations by the Food Standards Agency (2008), ISMP (2013) and Buckley & Shepherd (1993), the recommendations in the above tables address all of the perceptible information principles including 'providing compatibility with a variety of techniques or devices used by people with sensory limitations' which is addressed by the factor 'technology' in the knowledge acquisition table. It is also in line with the concept of the broader labelling system of advertising, point of purchase displays and product inserts with the actual product labelling as described in Bettman et al. (1986) for the Human Information Processing model.

In regards to technology specifically, it could be used to enhance the information that consumers receive but there is limited evidence of its effectiveness, the evidence available is limited by small sample sizes, and it may not be accessible for all people. For example, mobile technologies have the potential to provide consumers with detailed product information that they can personalise so that they receive the information that is important to them. This technology would require the consumer to scan a label on either the shelf or product with their mobile phone and then they could choose to read the information on the screen or listen to it through the speaker.

Although not the focus of this review, when interpreting the review findings it is important to consider branding and the impact of company brand guidelines. Companies have stringent brand strategies to drive brand loyalty and brand recognition including strict use of font size, colour, typography and space formats, which can impact on readability, level of information importance (depending on size, location and space given to mandatory information.). Use of corporate colours as backgrounds or type is extended throughout the label format and is primarily design and guideline driven.

Objective 5

- **To identify how other factors such as believability, authoritativeness, and whether the label elements are mandated by government or provided voluntarily by the manufacturer, impact on attention, accessibility, credibility, trust, legibility, comprehension, understanding, use and effectiveness of label information.**

No literature was located on the impact mandated versus voluntary information has on attention, knowledge acquisition or compliance.

Conclusions:

This review has provided evidence to assist in evaluating and responding to the four recommendations. Many studies reviewed are specific to the nutrition information panel, warnings on products or medication labels; however it is likely that principles about formatting will transfer between these contexts because the sizes of the labels are comparable and similar principles will be needed to gain attention, as well as support knowledge acquisition and compliance. There is a need to conduct studies investigating the actual or simulated use (rather than self-reported use in surveys) of labels by consumers in supermarkets and the use of technology to augment the information provided on labels. Within these studies there is a need to investigate the optimal font, text size, colour and format for communication of mandatory information.

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8 Attachments

8.1 ATTACHMENT I

Overall analysis of the models

Elaboration likelihood model (ELM)

Referenced from the paper, *Davies and Wright, The importance of labelling examined in food marketing, 1993* and *Wright, Exploring the need for extended research: an investigation of consumer attitudes to product labelling, 1997*. Attachment V provides an illustration of the model.

Outline of the model:

- It is an approach used in advertising to understand communication.
- It attempts to make sense of the major processes underlying persuasion and was used to examine the importance of labelling in general in food marketing.
- It indicates there are two factors that impact on the persuasiveness of labelling for food:
 1. Motivation (strongly influenced by personal relevance and existing attitudes)
 2. Capability (influenced by existing knowledge and thereby ability to determine relevance and importance to themselves and interpret the information)
- If consumer motivation and the ability to evaluate the information presented is high, the processing of information communicated is likely to be thorough and referred to as the central route to persuasion – which it is seen as the most effective and long lasting.
- If consumer motivation and ability is low or moderate, the model suggests a peripheral route is used and attitudes are determined instead by positive or negative cues from such things as through source effects (i.e. relying on the brand and product familiarity as a decision factor) or by executional features (such as the way an appeal is expressed and visualized) – this is seen as least effective and only temporarily effective.
- The paper, *Davies & Wright (1993)*, suggests that consumers are encouraged to process information along the peripheral route or by using source effects (e.g. brand) when there is a lack of consumer knowledge, spurious or unclear food claims or complexity with which information is presented, all of which make ingredient cues and other food claims difficult to encode in a meaningful way and result in impulse purchases.
- Either path was viewed as accounting for the discrepancy between concern over labelling contents such as additives and contradictory behaviour.
- It was concluded that only when there is ample ability and motivation to process the information along the central route to persuasion will improved labelling have an impact.

Strengths and useful elements:

- For the purposes of this review the model mainly reminds us that other factors outside the presentation and formatting itself (such as wide community education and existing mindsets) will significantly influence the effectiveness of the mandatory information on labels.
- It also suggests that the presentation and format will be particularly important for instances where the peripheral route applies (e.g. low or moderate motivation and ability).
- Importantly it indicates the need to understand the 'mindsets' and capabilities that exist in the target audiences for the labels.

Weakness of the model for the purposes of the review

- The model does not provide specific insight into the elements needed to maximise the

effectiveness of the formatting or presentation of labelling in general and for the mandatory information in particular.

Conclusion as to the applicability of the model for the review objectives

- Beyond providing recognition of factors outside the presentation and formatting that significantly influence the effectiveness of the mandatory information on labels (such as community education and existing mindsets), the model has limited application for this project.

Persuasive Communications Theory

Referenced from the paper, *Andrews et al, Believability and attitudes toward alcohol warning label information: The role of persuasive communication theory, 1990*

Outline of the model:

- It has been used as a framework to enhance the effectiveness of warning label information and to better understand the likelihood and facilitating conditions under which the objectives of informing (e.g., message believability) can be accomplished (Andrews 1990).
- It also indicates that once an individual believes (i.e. accepts) the warning label information, a favourable attitude toward the label information is necessary before one can expect any change in intention or behaviour.
- There were three primary conclusions from Andrews' research on alcohol warning signs using the persuasion communications theory:
 1. While all five of the alcohol warning labels were found to be believable, those that had a publicised history (so established presence), used a credible source (such as the Surgeon General), and the more personalised the message the better (e.g. impairs 'your' ability) were deemed to be more believable.
 2. Prior attitudes and beliefs toward alcohol consumption do have an influence on label believability and attitudes, but they do not mediate the effect of the different warning labels on label believability and attitudes – therefore it appears that prior attitudes and beliefs have an independent influence on the acceptance and persuasion resulting from warning label information
 3. Those with more favourable attitudes toward drinking (i.e. higher desire/behaviour to drink) seem to disbelieve warnings about the short-term effects of alcohol consumption and abuse (i.e. birth defects, driving impairment and drug combination warnings), while appearing to dislike the long-term risks of alcohol consumption and abuse (i.e. hypertension, liver disease, cancer and addiction).

Strengths and useful elements:

- Like the ELM, the model mainly reminds us that other factors outside the presentation and formatting itself (such as prior attitudes and beliefs, personalisation of information, use of credible sources and establishment of certain claims as accepted norms) will significantly influence the effectiveness of the mandatory information on labels.
- It also indicates that understanding the target audiences existing attitudes, beliefs and behaviours is important.

Weakness of the model for the purposes of the review

- The model does not provide specific insight into the elements needed to maximise the effectiveness of the formatting or presentation of labelling in general and for the mandatory information in particular.

Conclusion as to the applicability of the model for the review objectives

- Like the ELM model, the persuasive communication model has limited application for this project, beyond providing recognition of factors outside the presentation and formatting that significantly influence the effectiveness of the mandatory information on labels (such as community education and existing mindsets).

Consumer decision making and attitude formation and change

Referenced from the paper, *Grunert and Wills, A review of European research on*

consumer response to nutrition information on food labels, 2007. Attachment VI provides an illustration of the model.

Outline of the model:

- The model was developed by Grunert and Wills (2007) to review European research on consumer response to nutrition information on food labels based on two streams of research.
- Its basic structure is inspired by classic step models of consumer decision-making (e.g. Engel et al. 1968) and hierarchy of effects models of communication effects (e.g. Lavidge and Steiner 1961).
- It is based on the idea that people move through a number of stages of reading a label from searching for label information to using the label information to make a purchase decision. Interest, knowledge, demographics and label format are considered to impact on the person's movement through these stages.
- The following provides the stages and influencers of the model.
 1. Search and exposure: Only labels to which consumers are exposed can be expected to have any effects and the likelihood of exposure is increased if consumers actually search for the label information, though active search is not a necessary precondition for exposure, which may be accidental.
 2. Perception (conscious and subconscious): Exposure leads to effects on subsequent behaviour only when the information is perceived. Perception can be conscious or subconscious, though conscious perception is expected to have stronger effects on subsequent behaviour.
 3. Understanding and inferences (subjective and objective): Perception leads to understanding, which is the meaning the consumer attaches to what is perceived. In analysing understanding, it is important to distinguish between subjective and objective understanding. Subjective understanding is the meaning the consumer attaches to the perceived label information and covers also the extent to which consumers believe they have "understood" what is being communicated. Objective understanding is whether the meaning the consumer has attached to the label information is compatible with the meaning that the sender of the label information intended to communicate. These may be quite different. Understanding is to a large degree a question of inferences. Consumers relate the perceived information to their pre-existing knowledge and use this to infer meaning.
 4. Liking: Another effect of perception and processing of the information may be 'liking' of the label. Consumers may like the label—for example because they find it easy to understand and useful, or also because they like the symbols and colours used. Liking need not be linked to understanding, but can have impact on use of the label, as a label that is liked can lead to a more positive evaluation of the product even when it is not understood (so-called peripheral information processing).
 5. Use (one-time, extended, direct and indirect): Finally, the label information may be used in making choices based on direct and indirect effects, and between one-time and extended effects. Direct, one-time effects are the effects of the label information on the choice of the product that bears the label and in the context of the purchase where the label information was perceived. Direct, extended effects are effects on the purchase of the product bearing the label over time, where information effects may be cumulative and may extend after the product may have ceased bearing the label or after the label information has been altered. Indirect effects are effects on all other food purchases whereby the processing of label information may alter the overall pattern of food purchases—label information may result in the consumer learning about which product categories are more healthy and which are less, and this may alter the overall pattern of purchases such that categories now regarded as less healthy are bought less and categories regarded as more healthy are bought more often.

6. Interest, knowledge, demographics and label format: The model indicates that search, perception, understanding and use will be influenced by a number of factors, with the most prominent ones being interest, knowledge, demographics and label format. Interest in nutrition issues can be expected to have effects on all phases of the process. Knowledge about nutrition issues can be expected to have effects especially on understanding and use. Consumer demographics are often discussed as determinants, though they are more likely to be correlates of actual determinants, such as interest in and knowledge about nutrition, price consciousness or health status. On the information supply side, the format of the label (most relevant to this project) is presented as having a major impact.

Strengths and useful elements:

- The model provides a valuable overall conceptual framework of the stages that consumers go through and the influencers on the process, with label format only being one of those key influencers.

Weakness of the model for the purposes of the review

- With the label format overall being only one part of the model in terms of influencers, it is somewhat limited in providing the insight in to specific elements of label formatting and presentation, which is the focus of this project.

Conclusion as to the applicability of the model for the review objectives

- Due to the lack of detail around the elements of label format, the model has limited applicability in this instance; other than within each element of label format understanding the relevant impact on the different stages consumers pass through.

Conceptual framework of consumers' understanding and use of information on food labels

Referenced from the paper, *Jacobs et al, Adult consumers' understanding and use of information on food labels: a study among consumers living in the Potchefstroom and Klerksdorp regions, South Africa, 2010*. Attachment VII provides an illustration of the model.

Outline of the model:

- To illustrate consumers' understanding and use of information on food labels, the conceptual frameworks of Balasubramanian & Cole (2002), Drichoutis et al. (2005) and Gracia et al. (2007) were adopted and used to develop a decision-making framework for use in the study. The framework includes the following:
 1. Need/Motivation: Consumers' decision making entails the processes that influence their product choices when multiple options are available, and how the information that is available for each alternative choice might affect their product choice. Therefore, when consumers experience a specific need, or are motivated to purchase a certain food product, both the information that is given on the food label and the consumer's evaluation thereof are likely to influence their decision to purchase the product. The higher the consumer's perceived health risk that is associated with the use of the product, the more involved the consumer is likely to be in the search for, and evaluation of, product information. This implies that consumers differ in their motivation to search for or to use the information that is supplied on food labels.
 2. Information search and understanding (reading and interpreting): Consumer searching for information on food labels could either be active or accidental, although such searching is affected by the extent to which they understand the information. The extent to which consumers understand (subjective and objectively) the information that is supplied on food labels is dependent on their cognitive abilities to read and interpret the information on the concerned labels.
 3. Evaluating and using the information: Consumer understanding of the information provided determines how, and whether, the information on food labels is used when choosing which food products to purchase. Furthermore, consumer use of

food labels specifically refers to their reading, interpretation and evaluation of the information that is supplied on food labels, which also helps to determine the importance that consumers accord to such information.

4. External influences: The external influences are included due to their role in determining the information provided on food labels (food labelling regulation, the role of food manufacturers, the food label information and the product attributes)
 5. Internal influences: These are the influencers that are within the consumer (demographic characteristics and situational factors like income and time constraints)
- The conceptual framework indicates that both the external and internal influences directly affect consumers' understanding and use of food label information, as well as, ultimately, their ability to make informed food choices.

Strengths and useful elements:

- Similar to Grunert and Wills (2007), this model provides a valuable overall conceptual framework of the stages that consumers go through and the broad influencers on the process, with elements of the label being one of those influencers.

Weakness of the model for the purposes of the review

- With the label being only one part of the model in terms of influencers, it is somewhat limited in providing the insight in to specific elements of label formatting and presentation, which is the focus of this project.

Conclusion as to the applicability of the model for the review objectives

- It provides a very similar conceptual framework as Grunert and Wills (2007) and due to the lack of detail around the elements of label format it has limited applicability in this instance.

Perceptual model for food labelling

Referenced from the paper, *Kempen et al, An exploration of the influence of food labels on South African consumers' purchasing behaviour, 2011*. Attachment VIII provides an illustration of the model.

Outline of the model:

- Taking into account the food perceptual model proposed by Sijtsema et al. (2002), the findings from the study Kempen et al were applied to offer an adapted perceptual model.
- This model indicates how food labels in general terms, which can be considered a food product characteristic in terms of Sijtsema et al. (2002) food perceptual model, contribute to food perception, which may be used to make purchasing decisions. The model also acknowledges that the influence of food labels on consumers' purchasing behaviour is also subject to both influential and consideration levels and not based on the food label on its own.
- The model proposes that food labels include both ingredient and nutrition information as two further food product characteristics. It is also proposed that both these product characteristics are used in an assessment capacity, which includes nutritional, personal, health and quality assessment to form a perception of the food product, which may then be used to make a purchasing decision and ultimately influence purchase behaviour.
- The model indicates that the purchasing decision may be based on how much influence the food label has on purchasing decision and at the same time additional factors have an effect on the purchasing decision at the perception stage and the purchase decision stage.
- At the perception stage the other factors include the individual (e.g. their existing internal attitudes and knowledge), context and the environment.
- At the purchase decision stage there is an influential level leading from the nutritional, personal, health and quality assessments. Secondly there is the consideration level, which includes purchasing stimuli such as situational, extrinsic and intrinsic factors, which Kempen et al. (2011) suggest can be regarded as an indirect influence that

may guide the purchasing decision.

Strengths and useful elements:

- The model acknowledges and focuses on the role the label and in particular the nutrition and ingredient information can play in the forming of food perceptions and how it may influence purchasing decisions.

Weakness of the model for the purposes of the review

- The model provides no specific focus on the elements relating to label format and presentation.

Conclusion as to the applicability of the model for the review objectives

- The model does not provide a useful framework for this particular project.

Information interaction

Referenced from the paper, *Toms, Information Interaction: Providing a Framework for Information Architecture, 2002*. Attachment IX provides an illustration of the model.

Outline of the model:

- Information interaction describes how people interact with information.
- Toms (2002) used this model for understanding how people access information on computers but the process has the potential to be applied more broadly, including in food labelling.
- The model is comprised of the following:
 1. Determine or recognise goal or simply initiate – In information interaction, people are likely to perform several iterations of the process. They either initiate the process by formulating a goal (i.e. the traditional information seeking process) or simply by making a decision to examine a body of information.
 2. Select category – A category (such as a menu) is selected. The person scans the information that can include being graphical.
 3. Note cue – In scanning the category information the person may notice a cue which they stop to examine
 4. Read and extract – Then the person decides whether or not to extract/use the information.
 5. Integrate – The information that has been extracted is integrated with information previously known
 6. Evaluate – In essence, people are constantly questioning: is this information useful?
 7. Recycle – A person may recycle in multiple, non-linear ways through category selection, cues and extraction.

Strengths and useful elements:

- The model provides another perspective on the information stages. The stage in terms of noting a cue provides a difference concept on something needing to gain attention.

Weakness of the model for the purposes of the review

- The model does not add to the other broad conceptual frameworks and does not provide specific links to information (label) design elements.

Conclusion as to the applicability of the model for the review objectives

The model does not provide a useful framework for this particular project.

Evaluability principle

Referenced from the paper, *Visschers and Siegrist, Applying the Evaluability principle to nutrition table information. How reference information changes people's perception of food products, 2002*. Attachment X provides an illustration of the model.

Outline of the model:

- The evaluability principle states that 'when people evaluate a product on an attribute that does not have clear boundaries or references (e.g. the amount of fat in a food product), the presence of similar information about another product can affect this evaluation'. In other words the evaluability principle asserts that people base their

evaluation of a difficult-to-evaluate attribute on information about a reference product.

- In addition, it was asserted that people seem to benefit from summary information and graphical presentations in nutrition tables. Consumers are then able to compare food products on a single attribute and can neglect all other attributes. This second product acts as a reference for comparing the first product.
- Visschers and Siegrist (2002) included in their study (to test the principle and associated assertions) reference information on individual products by including an arrow indicating how healthy all sorts of chocolate bars are and how healthy that specific chocolate bar is.
- The study found that nutrition tables that are adapted to the evaluability principle appear to influence product perception to be more reflective of its nutritional value. However, this seems to depend on the product's nutritional value and on people's primary connotation for the product.

Strengths and useful elements:

- The evaluative principle provides a useful piece of information on the effectiveness and value of a reference point and its graphical representation.

Weakness of the model for the purposes of the review

- The principle is limited to a particular aspect of format and design.

Conclusion as to the applicability of the model for the review objectives

- The principle is appropriate to use in this particular project in respect to one particular aspect – i.e. the use of a reference point (e.g. graphically) for comparison and assessment.

Proximity Compatibility Principle (PCP)

Referenced from the paper, *Marino and Mahan, Configural Displays can Improve Nutrition-Related Decision: An Application of the Proximity Compatibility Principle, 2005.*

Outline of the model:

- The Proximity Compatibility Principle (PCP) is a set of principles that incorporates a variety of psychological mechanisms, such as attention, object perception and working memory, to link the visual processing of display characteristics to the cognitive processing of decision task characteristics.
- Display proximity and task proximity are two important aspects of the PCP. *Task proximity* refers to the way an individual piece of information is used to perform a task and *display proximity* refers to the level of integration of display features.
- In essence, the principle is based on the understanding that the effectiveness of a label will be maximised when the display of information matches the demands of the task. For example, for information that consumers need to filter, a display format is needed that highlights each piece of information with an indicator, such as numbers or bar graphs. Whereas if consumers need to integrate information on the label, information should be presented in parallel to facilitate divided attention.
- Marino and Mahan conducted a study where they compared the effectiveness of matching or not matching the display format to the task demands (e.g. filtering or integrating information). This study found that when the display format was matched to the task demands participants were more likely to select the product with better nutritional content.

Strengths and useful elements:

- The Proximity Compatibility Principle provides a practical framework in terms of the need to identify the specific tasks to be completed, which in turn determines the design or display of the information that is required.

Weakness of the model for the purposes of the review

- While the overall principle and broad application of the principle is valuable and useful, the information available does not provide specific or definitive details on what type of format or display should be applied for the different task-sets.

Conclusion as to the applicability of the model for the review objectives

The principle will be a useful broad tool to consider using to guide label design for mandatory information but does not provide enough of a framework for this report.

8.2 ATTACHMENT II

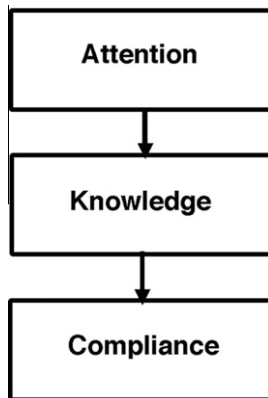


Figure 2 Attention, Knowledge Compliance model (Laughery & Wogalter in press)

8.3 ATTACHMENT III

Table 10 Recommendations from the UK Food Standards Agency on the format of food labelling (Food Standards Agency 2008)

	Best Practice Advice		
	Recommended	To be used with care	Best avoided
Font type and format	<ul style="list-style-type: none"> • Open fonts such as Arial for letters • Bold type if print quality is retained • Minimum font size of 8-point* if contrast, text format and print quality is a high standard. If they are not of a high standard a larger font size should be used 	<ul style="list-style-type: none"> • Bold type • Uppercase letters • Underlining • Hyphenation • Justified text • Coloured text/backgrounds • Where space is limited at least the name of the food, the date mark, list of ingredients and allergen information should be listed in 10-point, with a minimum of size 6-point used for other information 	<ul style="list-style-type: none"> • Ornate fonts • Shadowing • Italics
Contrast	<ul style="list-style-type: none"> • Black type on a white background or good tonal contrast of at least 70% 	<ul style="list-style-type: none"> • Light type on a dark background • Where packaging is transparent, good contrast is necessary with food product forming the visible background • Watermarking or non-solid background (e.g. dot filled background) where text appears 	<ul style="list-style-type: none"> • Dark type on a dark background • Light type on a light background • Green/red or yellow/white combinations
Layout	<ul style="list-style-type: none"> • Text that starts from and is aligned with the left margin 	<ul style="list-style-type: none"> • Text wrapping 	
Surfaces	<ul style="list-style-type: none"> • Matt finish printing surface 		<ul style="list-style-type: none"> • Metallic and shiny surfaces • Rough surfaces

Note. *Different fonts can have different character heights. These recommendations are based on an 8-point font size having the lower case letter 'o' with a height of 1.6mm.

8.4 ATTACHMENT IV

Table 11 Recommendations for text on food labels (Buckley & Shepherd 1993)

Character size	10 minutes of arc 3 mm per metre viewing distance
Orientation	Horizontally printed wording rather than vertically printed wording (recognised quicker)
Pack information load	Maximum visual impact – (cluttered labels harder to read) No more than five geometric shapes and no more than nine colour combinations of hue, brightness and saturation on any one label. The amount of information surrounding a panel should be limited
Typography	Sans-serif typeface with a stroke width to character height ratio of 1:7 for letters and 1:10 for numerals
Leading	Spacing of 25% of character height is optimal
Spacing	Very close spacing between words should be avoided
Brightness	Ratio of 3:1 for information brightness relative to background
Location of information	No information on necks of bottles Information panels are printed in standard positions on packets
Use of shaped information	Works to arrange/organise information but no more than five shapes or it reduces noticeability

8.5 ATTACHMENT V

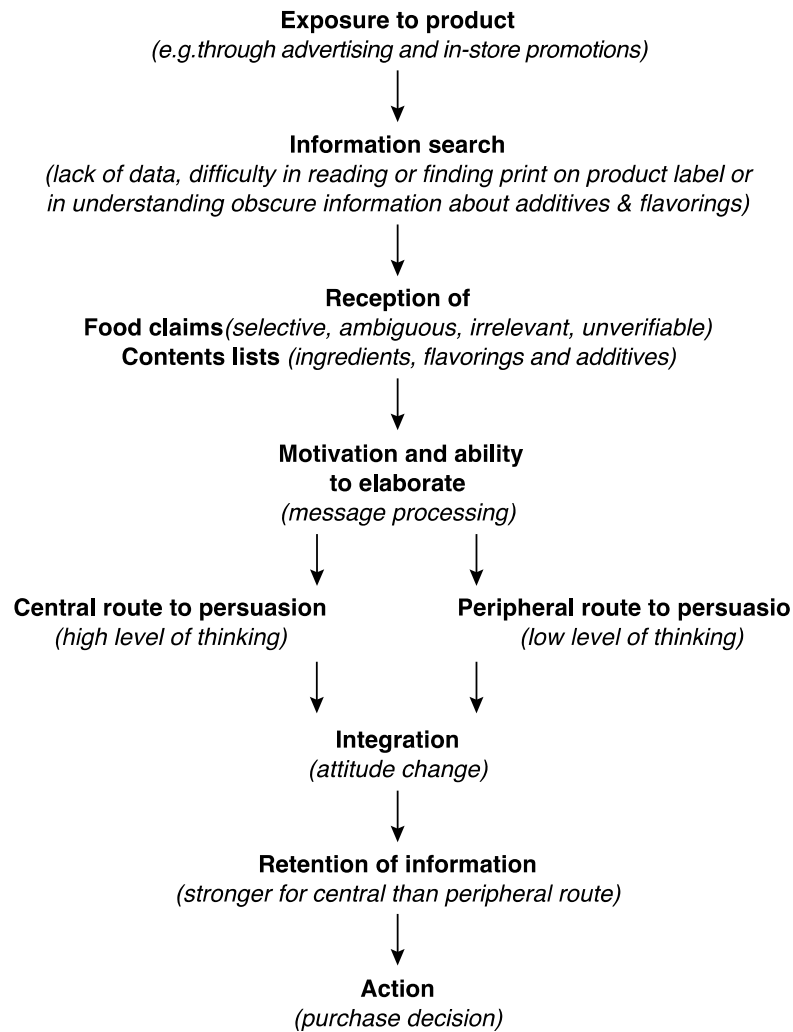


Figure 3 Applying an ELM sequence to consumer attitude change (Wright 1997, p419)

8.6 ATTACHMENT VI

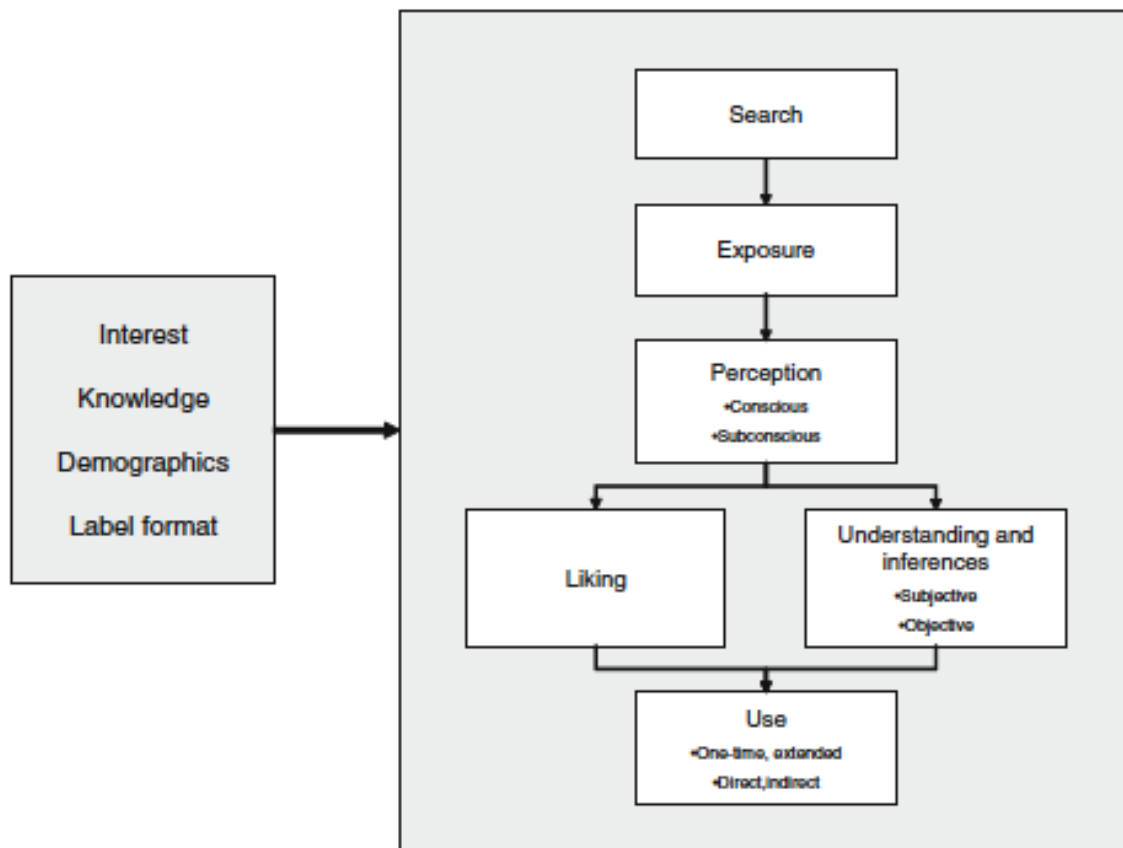


Figure 4 Model of consumer decision making and attitude formation and change (Grunert & Wills 2007, p387)

8.7 ATTACHMENT VII

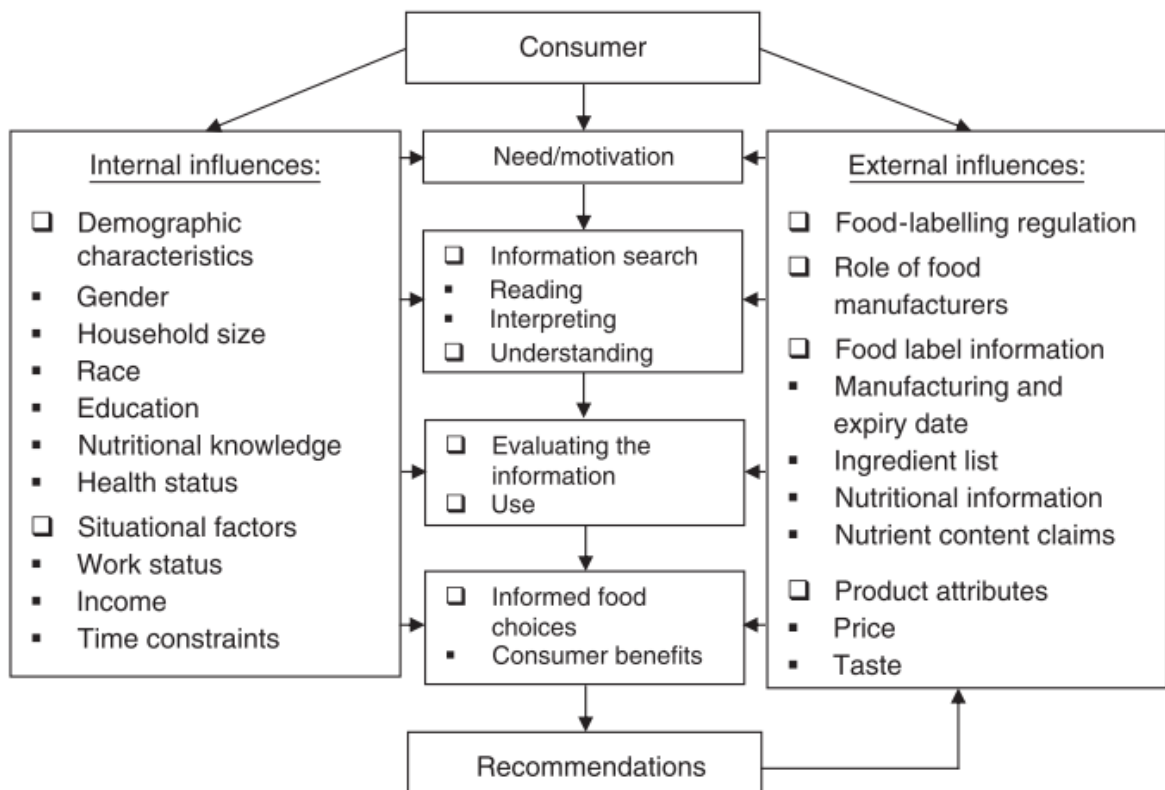


Figure 5 Conceptual framework of consumers' understanding and use of information on food labels (Jacobs et al. 2011, p511)

8.8 ATTACHMENT VIII

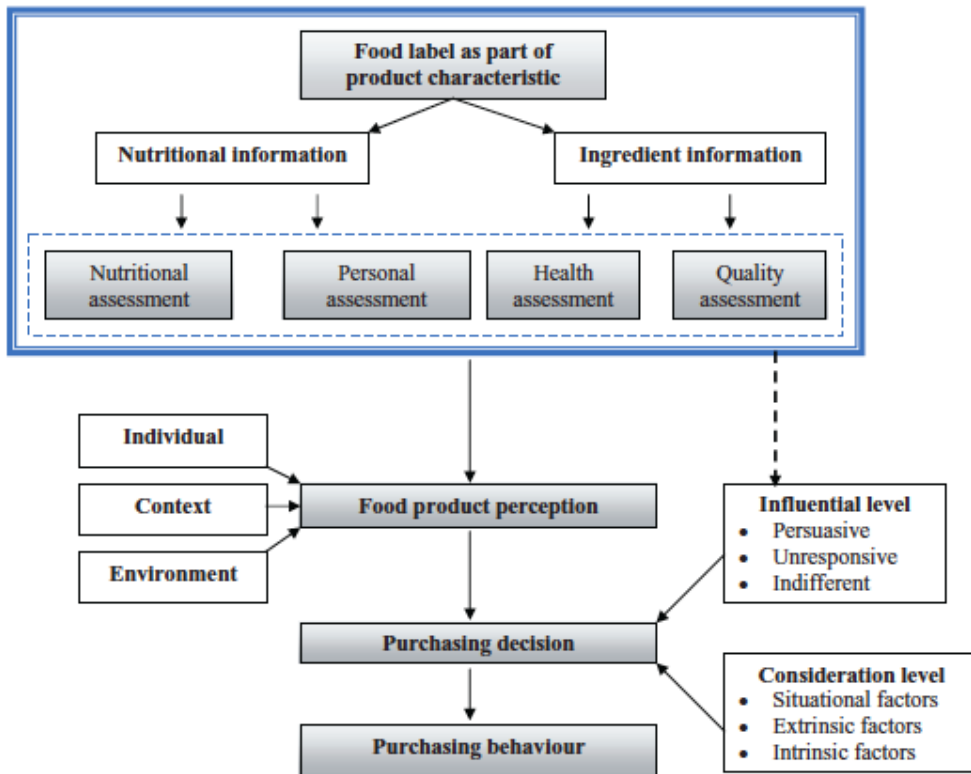


Figure 6 Perceptual model for food labelling (Kempen, Bosman et al. 2011, p75)

8.9 ATTACHMENT IX

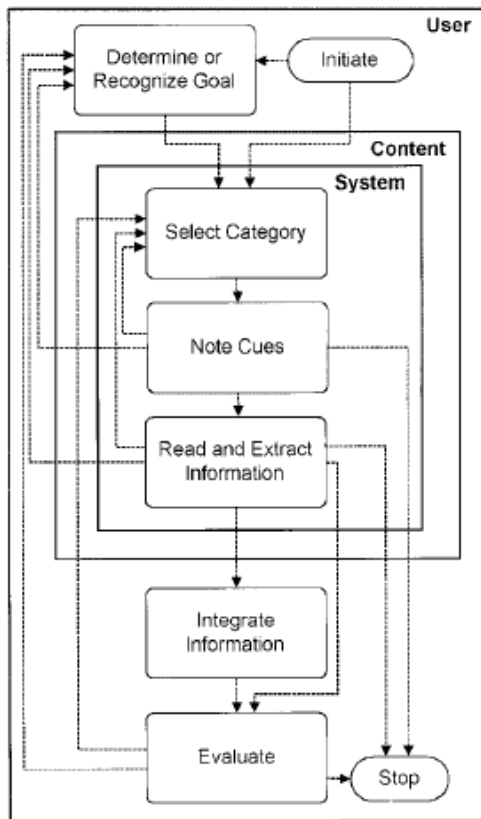


Figure 7 Model of information interaction, (Toms 2002, p857)

