

# The Development of Nutrition Pictograph Design on Food Labeling using Delphi Technique

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## ARTICLE HISTORY

Received  
10 April 2020

Accepted  
19 June 2020

Available online  
30 June 2020

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## ABSTRACT

Recently consumers are facing the issue of health problems such as Non - Communicable Disease (NCD) occurring in the society due to unhealthy lifestyle and behaviours. Consumers have claimed that they have knowledge about nutrition information but with low awareness level to read the nutrition information and difficulties to interpret the nutrition information on the food label. The nutrition contained in the food has been presented in numerical data and unattractive design. Plus, the rush when shopping will make the consumers neglect to read the food label. This research attempted to focus on the development of a suitable and usable nutrition pictograph design as a tool to educate the consumers in choosing a healthier selection of packed food. The researchers used the Delphi Technique as a medium in choosing the appropriate nutrition pictograph design, which should be incorporated into the selected food label. Findings from this study revealed positive feedback and reached a consensus, and all expert panels have agreed on the development of the nutrition pictogram design. Therefore, the implication of this study is targeted towards the consumers, Ministry of Health and food manufacturers. It can also contribute to the growth of the Visual Communication field. This nutrition pictograph design is intended to educate and inculcate the consumers and enhance health awareness in selecting the healthier choice of food.

**Keywords:** Delphi Techniques; pictograph design; food label; nutrition information; health awareness education.

## 1. INTRODUCTION

At present, consumers are supplied with various types of processed food and packed food in the market. While these growths are generally positive to the food manufacturer, the potential that consumers are being misled by foods labels should be taken into consideration. It is important to choose healthier food. Nutrition plays a critical role in preventing the prevalence of diseases [1]. Typically, consumers tend to buy their preferred food without looking at the food label. Poor eating habits are major public health concerns among young adults which may cause stress and lack of time; thus, it will be a barrier against the adoption of healthy behaviours [2]. Therefore, consumers should be using their knowledge and ability to read effectively in interpreting the food labelling wisely. Then, that information should be used to decide whether to purchase the food or not [3].

## **2. BACKGROUND OF STUDY**

Therefore, this research aims to design and develop a suitable and usable nutrition pictograph design as a quick tool to educate and help consumers in choosing a healthier selection of packed food using the Delphi Technique. Consumers need to be educated on the effective use of nutrition information on food packages as urged by [4]. The importance of reading food label has been highlighted by many authorised organisations, but again, consumers ignored this practice because of the awareness level. [5] emphasized that since the increase of health issues are associated with food and nutrition labelling, consumers are now giving more attention to the matter. Thus, there is no doubt that nutrition labelling is one of the most important issues that must be known to all consumers. These growths of various types of packed foods in the market may lead the consumers to be misled by the nutrition information on the labels of the foods that should be taken into consideration. Nevertheless, this behaviour can be prevented by making changes in society's daily diet habit and lifestyle, which includes the way we eat. In addition, [6] stated that people made the decision on their food based on their preferences, however, with guidance on the food content would give them an alternative in making a better choice.

## **3. PROBLEM STATEMENT**

There are various approaches of visual guidance on food label developed around the world. Many countries have developed their own labels; for example, the Multiple Traffic Light system and the Guideline Daily Amount developed in the United Kingdom, Green Keyhole Symbol in Sweden, the Heart Symbol in Finland, the Pick the Tick logo in Australia and New Zealand. Also, the Nuval system, the Guiding Stars symbol, and the Smart Choices program were developed in the United States [7]. The approach that has been introduced in Malaysia is called the Front of Pack (FOP) Labelling for Energy [8]. The voluntary implementation of this icon by the food industry is a guideline plan for individual energy daily intake. The icon is a quick representation aims to guide consumers regarding calorie content in a food product. It also helps to ease consumers' attempt at planning as well as controlling their daily energy intake.

A study to investigate the effect of the development of a nutrition logo on healthier products among food manufacturer companies emphasized that their study is to help consumers to make healthier food choices by reading the front-of-pack nutrition labels to encourage respective companies to reformulate existing products and develop new products based on a healthier product composition [7]. In overall, though these nutrition labels have differences in terms of designs and product criteria, in general, it had the same intention which is to help consumers to choose healthier food and to encourage the development of healthier products among food manufacturers.

#### 4. RESEARCH OBJECTIVE

The present study seeks to provide more insights on the healthy food selection by the assistances of nutrition pictograph design on the food label. Thus, this research intended to develop a suitable and usable nutrition pictograph design using Delphi Technique as a quick tool to educate and help the consumers in choosing a healthier selection of packed food.

#### 5. METHODOLOGY

This research applies the Design and Development Method [9] that focuses on the development of the nutrition pictograph design. DDR is the systematic study of designing, developing and evaluating instructional programs, processes and products that must meet the criteria of internal consistency and effectiveness [10]. Through the DDR method, researchers applied The Delphi technique to obtain respondents' understanding and opinions regarding the development of a nutrition pictograph design. Delphi Technique is an approach developed as an interactive forecasting and systematic method involving expert panels. The researchers used the Delphi Technique by utilizing two rounds of survey which involves seven expert panels as respondents. Three respondents are experts from the Visual Communication area. Their role is to advise and share opinions on the development of nutrition pictograph design. While the other four respondents are experts in the food nutrition and health sciences which will guide on the suitability and content of the nutrition pictograph. All seven panels have more than five years of working experiences as an educator and graphic designer. The researchers have chosen these expert panels because of their knowledge in their own fields. Furthermore, [11] also stated that studies employing Delphi do make use of individuals who have knowledge on the topic being investigated. The respondents rated all the questions using the 4-point Likert Scale from strongly disagree to strongly agree. The data was analysed thematically in order to look at the items needed to be inserted into the survey forms for the Delphi survey process. Meanwhile, data collections from questionnaires were analysed using SPSS in order to identify the descriptive data analysis.

#### 6. RESULT & DISCUSSION

This part discusses the findings from the analysis of Delphi Round 1 and 2. All expert panels have answered the survey given separately in two different sessions. Data will be presented in the tables below. Finally, data collection from Delphi Round 1 and 2 were analysed using Wilcoxon Match Pair test to get the validity and consensus level from experts.

##### 6.1 *Analysis of Delphi Round 1*

Delphi technique round one encloses two (2) parts consists of Part A and Part B. Firstly, analysis in Part A discussed the criteria regarding their understanding and the importance of reading nutrition labels. This part is vital to identify their acquaintances and familiarity with nutrition label awareness. From table 1, it is interpreted that all seven expert panels have shown their understanding and agreed that the development of nutrition pictograph is important based on high scores of consensus level. All seven panels have conceded opinions prior to the outcome of the development of nutrition pictograph which can be one of the prompt and effective medium to communicate with consumers while they are looking on packed food.

Criteria 1 received 100% of interquartile range, suggesting that all seven expert panels have agreed on the development of the new design for nutrition pictograph. Meanwhile, criteria 2,3,4, and 6 obtained a high median maximum reading of being accepted by the expert panels. However, criteria 5 has predicted no consensus level regarding the level of suitability of the new design of nutrition pictograph. Five (5) panels disagree with the suitability of the design because of its poor colour selection and confusing image representation among all nutrition pictograph designs. Consequently, the five panels advised changing both requirements in order to achieve a better understanding of the nutrition.

Table 1: Descriptive Statistic analysis for Part A

No	Criteria	%	Median	Max	Interquartile Range	Consensus Level
1.	Do you agree on the development of the new design for nutrition pictograph?	100	4	4	1	High
2.	Do you understand the message of this nutrition pictograph design?	100	3	4	1	High
3.	Does this nutrition pictograph design help the consumers to better understand the nutrition information contained in a food product?	100	3	4	1	High
4.	Do you agree on the new design of nutrition pictograph has high level of usability?	100	3	4	1	High
5.	Do you agree on the new design of nutrition pictograph has high level of suitability?	100	3	4	2	No consensus
6.	This nutrition pictograph can educate consumers regarding health awareness in selecting packed food in the market.	100	3	4	1	High

Secondly, analysis in Part B will elaborate all seven experts' opinions on the development of the nutrition pictograph design by evaluating the main elements and principles of design in which the criteria are images/ visuals, typography, colours, layouts and messages to be delivered in the design. Data collected in tables below demonstrated the readings of median, maximum range and interquartile range for the criteria proposed in developing nutrition pictograph design. Table 2 interpreted that the criteria for elements and principles of design have scored 100% while the interquartile range is from 0 to 1. The median and maximum reading is shown to be in the range of 2 and 4 for all criteria. The consensus level is shown to be high for all criteria. Though all consensus is high, but majority of the panels suggested to revise the design development in order to fit with food packaging suitability and reliability.

Table 2: Descriptive Statistic analysis for Part B Round 1

No	Criteria for elements and principles of design	%	Median	Max	Interquartile Range	Consensus Level	
1.		Image/ Visual	100	3	4	1	High
		Typography	100	3	4	1	High
		Colour	100	2	3	0	High
		Layout	100	3	4	1	High
		Message Delivered	100	3	4	1	High
2.		Image/ Visual	100	3	4	1	High
		Typography	100	3	4	1	High
		Colour	100	2	4	1	High
		Layout	100	3	4	1	High
		Message Delivered	100	4	4	1	High
3.		Image/ Visual	100	3	4	1	High
		Typography	100	3	4	1	High
		Colour	100	3	3	1	High
		Layout	100	4	4	1	High
		Message Delivered	100	4	4	1	High
4.		Image/ Visual	100	3	4	1	High
		Typography	100	3	4	1	High
		Colour	100	3	3	1	High
		Layout	100	4	4	1	High
		Message Delivered	100	4	4	1	High

Based on table 3 below, there are two different parts which contain 26 items. The analysis has indicated 96.2% as a result of a high consensus level from all the experts which consist of 25 items. Meanwhile, only 3.8% for 1 item did not get consensus from seven experts. In conclusion, Delphi Round 1 survey indicated high consensus among all expert panels and has agreed on the development of nutrition pictograph design on a food label but with some changes.

Table 3: Summary of Delphi Round One

No	Component	High Consensus (IQR: 0-1.01)	Moderate (IQR: 1.01-1.99)	No Consensus (IQR: 2.00&above)	Total
1.	<b>Part A</b> Criteria on the proposed nutrition pictograph	5	0	1	6
2.	<b>Part B</b> Criteria for elements and principles of design	20	0	0	20
	<b>Total</b>	25	0	1	26
		96.2%	0%	3.8%	100%

## 6.2 Analysis of Delphi Round 2





The second round of data collection and analysis was performed to gauge any variations in the feedbacks received from the first round. The duration of the gap between feedbacks collection from round one to round two was within a month. Table 4 displayed findings from the second round of the data collection. The median and maximum reading showed 3 to 4 range for all items. Interestingly, the second round displayed that all six criteria received high consensus level compared to the first round in which did not achieve any consensus from all seven expert's panel. All panels aligned with the changes in the development of nutrition pictograph during Delphi Round 2 survey. Table 1.4 presented that the criteria on the proposed nutrition pictograph have scored 100% while the interquartile range is (IQR) 1. The median and maximum reading shows the results in range of 3 and 4 for all criteria while the consensus level is high.

Table 4: Descriptive Statistic analysis for Part A Round 2

No	Criteria	%	Median	Max	Interquartile Range	Consensus Level
1.	Do you agree on the development of the new design for nutrition pictograph?	100	4	4	1	High
2.	Do you understand the message of this nutrition pictograph design?	100	4	4	1	High
3.	Does this nutrition pictograph design help the consumers to better understand the nutrition information contained in a food product?	100	3	4	1	High
4.	Do you agree on the new design of nutrition pictograph has high level of usability?	100	3	4	1	High
5.	Do you agree on the new design of nutrition pictograph has high level of suitability?	100	3	4	1	High
6.	This nutrition pictograph can educate consumers regarding health awareness in selecting packed food in the market.	100	4	4	1	High

Table 5 indicated that the criteria for elements and principles of design scored 100% while the interquartile range is 1. The median and maximum reading shows the results in the range of 3 and 4 for all criteria and the consensus level is high for all criteria. The nutrition pictograph design development went through a design process involving the application of elements and principles of design to make sure its suitability to communicate easily with the consumers.

Table 5: Descriptive Statistic analysis for Part B Round 2

No	Nutrition Pictograph Design	Criteria	%	Median	Max	Interquartile Range	Consensus Level
1.		Image/ Visual	100	3	4	1	High
		Typography	100	4	4	1	High
		Colour	100	3	4	1	High
		Layout	100	4	4	1	High
		Message Delivered	100	4	4	1	High
2.		Image/ Visual	100	3	4	1	High
		Typography	100	4	4	1	High
		Colour	100	4	4	1	High
		Layout	100	4	4	1	High
		Message Delivered	100	4	4	1	High
3.		Image/ Visual	100	3	4	1	High
		Typography	100	4	4	1	High
		Colour	100	3	4	1	High
		Layout	100	4	4	1	High
		Message Delivered	100	3	4	1	High
4.		Image/ Visual	100	4	4	1	High
		Typography	100	4	4	1	High
		Colour	100	4	4	1	High
		Layout	100	4	4	1	High
		Message Delivered	100	4	4	1	High



Based on table 6 below, two parts are consisting of the items from round two totalling to the amount of 26 items. The analysis has interpreted a score of 100% as a result of the high consensus level from seven experts for all items. In conclusion, Delphi Round 2 survey indicated high consensus among all seven expert panels and has agreed on the development of nutrition pictograph design on food label after the changes, yet it is suitable to be used on food packaging.

Table 6: Summary of Delphi Round Two

No	Component	High Consensus (IQR: 0-1.00)	Moderate (IQR: 1.01-1.99)	No Consensus (IQR: 2.00&above)	Total
1.	Part A Criteria on the proposed nutrition pictograph	6	0	0	6
2.	Part B Criteria for elements and principles of design	20	0	0	20
	<b>Total</b>	26	0	0	26
		100%	0%	0%	100%

### 6.3 Wilcoxon Matched Paired

Wilcoxon matched-pairs signed-ranks test is the program suitable to be used by many researchers in order to get the validity and consensus level from experts [12] and [13]. The final data from Delphi round one and round two was gathered in this program. The value for Wilcoxon is presented with the “Z” symbol. From the final data gained, a comparison will be made in order to obtain the level of significance. From the table above, if the data comparison shows a reading between 0 to -1.99, it means that there is no significance between the first and second round. On the other hand, if the data shows readings of -2.00 and above, it means that both scores are significant. From Table 1.7, the interquartile range for all items is 1. The data for Wilcoxon Matched Paired is from .000 to -1.633 for all items. There is no significance between the answers from experts in Delphi first and second round. The table also shows a score of 100 % for all items. This data proves that the development of the nutrition pictograph is suitable as agreed by all seven experts.






Table 7: Wilcoxon Matched Paired Statistic Analysis for Part A

No	Criteria	%	Median	Max	Interquar- tile Range	Consensus Level	Z Value	Significant difference between Round 1&2
1.	Do you agree on the development of the new design for nutrition pictograph?	100	4	4	1	High	-.577	No
2.	Do you understand the message of this nutrition pictograph design?	100	4	4	1	High	-1.000	No
3.	Does this nutrition pictograph design help the consumers to better understand the nutrition information contained in a food product?	100	4	4	1	High	-.447	No
4.	Do you agree on the new design of nutrition pictograph has high level of usability?	100	4	4	1	High	0.000	No
5.	Do you agree on the new design of nutrition pictograph has high level of suitability?	100	3	4	1	High	-1.633	No
6.	This nutrition pictograph can educate consumers regarding health awareness in selecting packed food in the market.	100	4	4	1	High	-1.414	No

From Table 8, “Z” value data for Wilcoxon Matched Paired is from .000 to -2.449 for all items. The interquartile range for all items is 1. There is no significance between the answers from experts in Delphi first and second round. However, only 1 item scored 2 for the interquartile range. It shows that the message delivered through item no.1 is significant. The table also shows a score of 100 % for all items. This data proves that the development of the nutrition pictograph is suitable as agreed by all seven experts with some changes in the nutrition pictograph design.

Table 8: Wilcoxon Matched Paired Statistic Analysis for Part B

Nutrition Pictograph Design	Criteria	%	Median	Max	Interquartile Range	Consensus Level	Z Value	Significant different between Round 1&2
1. 	Image/ Visual	100	3	4	1	High	-1.632	No
	Typography	100	4	4	1	High	-1.732	No
	Colour	100	3	4	1	High	-1.889	No
	Layout	100	4	4	1	High	-1.732	No
	Message Delivered	100	4	4	2	High	-0.966	No
2. 	Image/ Visual	100	3	4	1	High	-1.889	No
	Typography	100	4	4	1	High	-1.414	No
	Colour	100	3	4	1	High	-2.070	Yes
	Layout	100	4	4	1	High	-1.414	No
	Message Delivered	100	4	4	1	High	0.000	No
3. 	Image/ Visual	100	3	4	1	High	-2.000	Yes
	Typography	100	4	4	1	High	0.000	No
	Colour	100	3	4	1	High	-1.414	No
	Layout	100	4	4	1	High	0.000	No
	Message Delivered	100	3	4	1	High	-1.000	No
4. 	Image/ Visual	100	4	4	1	High	-2.236	Yes
	Typography	100	4	4	1	High	0.000	No
	Colour	100	4	4	1	High	-2.449	Yes
	Layout	100	4	4	1	High	0.000	No
	Message Delivered	100	4	4	1	High	-2.236	Yes

The development of nutrition pictograph design has shed some lights for the researchers in examining the understandings and the importance of the development of nutrition pictograph design. Opinions and considerations from all seven expert panels were taken into account as in Delphi Round 1 survey requires changes for colour and visual icon. The changes are important to the respondents and consumers because the development of nutrition pictograph must deliver its message as a quick tool of communication. Therefore, all seven expert panels reflected positive acceptance towards the importance of the development of nutrition pictograph based on high scores of consensus level. Meanwhile, result from Delphi Round 2 survey indicated a consent among all seven panels on the development of nutrition pictograph after changes of colour and visual icon had been made. The proposed nutrition pictograph design has included

the application of the elements and principles of design appropriately by including suitable visuals, typography, colours, layout composition and also the value of usability and suitability.

## 7. CONCLUSION

The development of nutrition pictograph design as a quick process tool is to educate and help consumers to choose a healthier selection for packed food. In addition, this development of nutrition pictograph design can create health awareness education among consumers and society. Subsequently, the possibility of consumers having a clear, consistent, quick way to obtain information is high. This can help them to make informed choices about the food they buy and consume. Consumers need a quick understanding of the relative healthiness of a product. This is a significant step forward to help and educate consumers to be more selective in their food dietary choices and encourage people to eat healthier.

## REFERENCES

- [1] R. A. Al-Naggar & R. Chen, Nutrition and cancer prevention: knowledge, attitudes and practices among young Malaysians. *Asian Pac J Cancer Prev*, 12(3), 691-694, 2011.
- [2] D. Sundaram, H.F. Ghazi, & M. Elnajeh, Breakfast, food consumption pattern and nutritional status among private university students in Shah Alam, Malaysia. *Age*, 20(23), 271, 2013.
- [3] G. Samson, Awareness of food labelling and use of the information in purchasing pre packaged food products among consumers in Ilala Municipality Daresalaam. Muhimbili University of Health and Allied Sciences, 2012.
- [4] E. S Tee, , Nutrition information NutriScene. [http://www.standardsusers.org/standardsusers/index.php?option=com\\_content&view=article&id=2577:nutrition-information-nutriscene-by-dr-tee-e-siong&Itemid=87](http://www.standardsusers.org/standardsusers/index.php?option=com_content&view=article&id=2577:nutrition-information-nutriscene-by-dr-tee-e-siong&Itemid=87), 2015.
- [5] W. Kasapila, & S. Sharifudin, Harmonisation of Food Labelling Regulations in Southeast Asia: Benefits, Challenges and Implications, 20 (1): 1-8, 2011.
- [6] D.D. Hutton, Online Forum Views sought on traffic light labelling - (Food Standards Agency). <http://www.ifsqn.com/forum/index.php/topic/1772-views-sought-on-traffic-light-labelling-food-standards-agency/>, 2005.
- [7] E.L. Vyth, I.H. Steenhuis, A.J. Roodenburg, J. Brug & J.C. Seidell, Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 7(1), 65, 2010.
- [8] T. L Liow, [www.sihat.my/knowledge/view/knowledge/53/](http://www.sihat.my/knowledge/view/knowledge/53/). <http://www.sihat.my/knowledge/view/knowledge/53/>, 2005.
- [9] Richey & Klein, Design and Development Research: method, strategies and issues. London: Erlbaum, 2007.
- [10] Seels & Richey, Instructional Technology: the definition and domains of the field. Washington DC: Association for Education Communication and Technology, 1994.
- [11] F. Hasson, S. Keeney, & H. P. Mckenna, Research guidelines for the Delphi Survey Technique. *Journal of Advanced Nursing*, 1008-1015. DOI: 10.1046/j.1365-2648.2000.t01-1-01567.x, 2000.

- [12] M. Siti Zuraida & S. Saedah, The State of Technology and the Arts – Interactive Multimedia in Enhancing Culturally Responsive Pedagogy. *Procedia - Social and Behavioral Sciences*, 103, 1171–1180, 2013.
- [13] Z. A. Hazlin Aisha & M.Siti Zuraida, Interactive Visual Art Education Pedagogical Module: Typography in Visual Communication. Springer, Singapore. 171-182. [https://doi.org/10.1007/978-981-10-0954-9\\_15](https://doi.org/10.1007/978-981-10-0954-9_15), 2016