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MODELLING FOOD QUALITY:

Comments on a paper by H. Molnar

by

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Reprinted from:

Food Quality and Preference, Vol. 6, No. 3 (1995), pp. 189-190.

COMMENTARIES

Molnár's paper, which concerns the development and application of a quantitative model for the prediction of food quality, raises several interesting issues that strike at the heart of food quality assessment. These issues concern (1) the unitary vs. multivariate nature of food quality, (2) the role of experts vs. consumers in quality assessment, and (3) synthetic vs. analytic approaches to understanding quality.

Unitary vs. multivariate nature of food quality

As it relates to the unitary vs. multivariate nature of food quality, Molnár's paper beautifully underscores the essence of the problem. From both a conceptual and empirical standpoint, the approach outlined by Molnár assumes that food quality is a multivariate phenomenon. That is, it assumes that there exists a series of chemical, sensory, microbiological, and other characteristics of the product that comprise overall quality, and that each of these characteristics can be independently measured and then composited to index overall quality. However, the very fact that the model attempts to generate an overall index of food quality belies another assumption—that at some different level of analysis, food quality is really a unitary phenomenon, and that disparate products can be placed along a single continuum of good–bad quality. This dualistic view of the conceptual nature of food quality is evident in most attempts to model food quality and is a major contributing factor to the diversity of opinion and approaches for assessing food quality in the industry today.

From the consumer's perspective, food quality is certainly a unitary concept. When asked about the quality of a particular food item, the consumer does not pause, separate, and analyze all of the individual factors that may be contributing to his/her perception of the quality of the item. This is because humans are wonderfully adept at providing integrated responses to what appear to be, upon reflection, complex judgemental processes. In light of this unique ability, it is easy to understand why many researchers (e.g. Steenkamp, 1986; McNutt, 1988; Fishken, 1990; O'Mahony, 1991; Cardello, 1993, 1994*a,b*) place heavy emphasis on consumer judgements as a direct and practical measure of what is meant by a product's quality (quality as the degree of excellence of the product). Molnár's own definition of food quality acknowledges this reliance of food quality assessment on consumer opinion, as is reflected in his phrase 'in conformity with consumer requirements and acceptance.' Unfortunately, neither in the model he presents nor in the methodology for assessing quality is the consumer again mentioned. Molnár's entire approach to food quality is dependent upon direct expert judgements of either the product itself or of the importance of various instrumental and/or chemical data to the product's quality.

While my own opinions and approach to food quality are quite different from those outlined by Molnár, I will not belabor the issue of consumer vs. expert opinions of food quality, since this point is adequately discussed in other papers in this volume. Instead, it would be worthwhile to consider the methods that are used to arrive at numerical weightings and to generate the overall quality index.

Parameter weightings

Stated generally, Molnár's approach identifies a set of chemical, instrumental, sensory, and other variables that contribute to a product's overall quality. These variables are then quantified, and weightings are assigned by experts to index their relative importance to the product's quality. The weighted values are then integrated to arrive at a total quality index for the product. However, the approach appears to utilize a mix of subjective and/or synthetic methods and statistical/analytic procedures for identifying important variables and establishing their weightings. On the one hand, Molnár emphasizes the important role of the expert in identifying these attributes and establishing their weightings using the Delphi method. This latter method consists of a loosely defined set of procedures for arriving at a consensus among a set of experts 'when accurate information is unavailable or expensive to obtain, or evaluation models require subjective inputs to the point where they become the dominating parameters' (Linstone & Turoff, 1975). In essence, this method provides subjective data and numerical values that can be incorporated into the model in a synthetic approach to modeling quality. On the other hand, Molnár also stresses the importance of statistical analysis (pattern recognition, PCA, etc.) in identifying and weighting these factors. How these disparate forms of data are integrated to arrive at final parameter values for the model is left unstated.

A second problem with the model arises with the need to identify optimal and worst parameter values in order to normalize the absolute values on each parameter. Certainly, even experts will disagree on the optimal value of a given parameter to produce the highest quality in the product. Molnar acknowledges this problem in the text, and further work on reducing this obvious source of variability in the model is necessary.

Validity criteria

The last issue of some concern relates to the validity criterion that should be applied to the model. While the mathematics of the model will undoubtedly result in a predicted index of a product's overall quality, what is the validity criterion against which the predictions can be compared? Given that the method relies on expert opinion, one obvious validity criterion is the experts' own judgements of the overall quality of the items tested. While it is suggested that such classifications are done as part of model development, empirical data on post-development validity tests would be worthwhile.

Similarly, since the intent of the model is to predict food quality for purposes of both quality control and product improvement, alternative predictive validity criteria, e.g. consumer opinions of product quality, should be examined.

In spite of the above shortcomings, Molnár's model is a significant step forward in the quest to uncover the factors important to food quality and to develop a quantitative method to integrate these factors in a predictive manner. The model reflects both the progress made to date in understanding these factors, as well as the areas where continued research is necessary.

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