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Nutrition knowledge, attitudes and practices of food industry professionals

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Abstract

Food industry professionals may be influenced by various factors in their decision to make changes in food products to enhance nutritional value. This study used the Social Cognitive model to examine these factors. The factors considered included nutrition knowledge, attitudes towards nutrition, confidence in one's own knowledge to improve nutritional quality in food products, and the perception of the company's and the consumer's views in the development/marketing of nutritionally improved products. The study was carried out in two stages, firstly a self-administered questionnaire, followed by depth interviews. Of the 199 self-administered questionnaires distributed to food industry professionals, 46 (23%) were returned via mail or internet. Frequency distributions were calculated and regression analysis was conducted to analyze the model. The depth interview schedule was designed to explore in more depth the information gathered from the self-administered questionnaire. Twelve respondents who completed the self-administered questionnaire volunteered to participate in interviews.

Overall, it was found that more than two-thirds of food industry professionals surveyed carried out work practices related to enhancing the nutrition content of foods. Most commonly they had reduced fat and sodium in their food products. Nutrition knowledge and confidence in one's own ability to improve nutritional quality in food products were found to be related to work practices enhancing nutrition, but these relationships were mediated through perception of the company's concerns about nutrition. Personal attitudes towards nutrition, however, had little effect on nutrition related food practices at work, which may be because respondents just follow what the company wants, or it may be that there are other important factors which were not examined in this study. To conclude, the main influence of nutrition consideration as part of the product development process is the company's policy, thus if the government wants to see changes in the nutrient composition of foods one approach would be to promote nutrition policies in food companies, e.g. providing financial incentives.

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1. Introduction

The three major causes of death in New Zealand from 1997-1999 were cancer, ischaemic heart disease and cerebrovascular disease, which collectively accounted for almost 60% of all deaths in 1999 (New Zealand Health Information Service, 2003). The morbidity and mortality due to these diseases impose burdens on the patient, the family, the health services and the economy (Public Health Commission, 1995).

These diseases are called nutrition-related diseases (Public Health Commission, 1995). The diet of New Zealanders, which is high in fat, and low in fruits, vegetables, bread and cereals increases the risk of these diseases (Department of Health, 1991). It is claimed that as people become busier, there is a growing trend towards processed foods (Syme, 1999 and Forsyth, 1999) which are usually high in fat and salt (Yee and Young, 2001). This trend in consumption may increase the risk of these nutrition related diseases.

The Public Health Commission (PHC; 1995) proposed that improving the nutritional wellbeing of the population should result in a long-term reduction in prevalence of all nutrition-related diseases. For example, there was a recommendation that at least 70% of all adult New Zealanders were likely to improve their cardiovascular health by following a healthy diet called the 'cardioprotective dietary pattern', which is high in plant-based foods and low in fat, especially saturated fat (New Zealand Dietetic Association, 2000; National Heart Foundation, 1999). There were also recommendations for the population to reduce salt and sugar and increase the intake of fruit, vegetables, bread and cereals (Public Health Commission, 1995).

Despite a public health campaign attempting to raise New Zealanders awareness of the benefits of good nutrition, the population's nutrient and food intake as of the 1997 National Nutrition Survey has not met the guidelines of the New Zealand Nutrition Taskforce (1991). Guidelines that are yet to be met include the percentage energy from fat (30-33%), the percent of energy from carbohydrate (>50%), and the number of fruit and vegetable servings per day (≥ 5), although the trends are in the right direction (Russell

et al, 1999). Moreover, going against the trend of improvements, mean body weight has increased by 3.2 kg between 1989 and 1997 (University of Otago/Hillary Commission, 1991; Russell et al, 1999).

With the reluctance of some New Zealanders to change their diets, the government proposed another approach to help improving the health of the nation by providing consumers with healthier products (the Ministry of Health, 1999; PHC, 1995). The government recommended that the food industry improve the nutritional quality of their products; of particular interest was the reduction of fat, salt and sugar (PHC, 1995).

However, the Public Health Commission did not have any direct mechanism to influence food companies. Although there have been some changes in food composition, there has not been widespread changes across the food market.

The ideas for product development, e.g. altering a product to enhance nutritional value, come from the company objectives (Buisson, 1995). There are other factors that may influence the healthful food practices, such as personal concerns toward nutrition or technical knowledge of how to develop acceptable 'healthy' products (Reichler and Dalton, 1998).

Thus, this study aims to explore factors which may contribute to nutritionally improved products. Factors of interest include personal nutrition concerns and environmental factors, such as company's objectives. Because there may be constraints from the company, this study will separately investigate home and work practices enhancing nutrition. The hypothesis is that food industry professionals' personal nutrition concerns are related to practices enhancing nutrition both at work and at home.

2. Literature Review

2.1 Introduction

In the literature review the details of diet and health concerns of New Zealand will be described, as are different approaches to improve nutrition well-being of New Zealanders and factors that are related to 'healthy' food choices. There will also be the discussion about the role of the food industry in providing 'healthy' products, ways to include nutrition in the product development process and factors which may influence food industry professionals in the consideration of nutrition improvements in their products.

2.2 Nutritional status of New Zealanders

This section describes New Zealanders' nutrition related health problems, government recommendations for food and nutrition targets, current food and nutrient intake, trends in food consumption, the factors that influence healthier eating and the barriers to consuming healthy foods.

2.2.1 New Zealanders' nutrition related health problems

New Zealanders have a number of health conditions, which are thought to be the consequences of their lifestyle, environment and culture (Rowan et al, 1991). Among these 'lifestyle' diseases are cancer, ischaemic heart disease and cerebrovascular disease, three diseases which claim the highest proportion of adult deaths (Table 2.1; New Zealand Health Information Service, 2003).

Table 2.1: Three of the major causes of death in New Zealand from 1997 to 1999 (New Zealand Health Information Service, 2003)

Diseases	Male		Female	
	Number of deaths	% of all causes of deaths	Number of deaths	% of all causes of deaths
Cancer	4063	28.3	3610	26.0
Ischaemic heart disease	3639	25.4	2919	21.0
Cerebrovascular disease	1121	7.8	1699	12.2
Total	8823	61.5	8228	59.2

As shown in table 2.1, the three of major causes of death accounted for about 60% of death in New Zealand from 1997-1999 (New Zealand Health Information Service, 2003). The Public Health Commission (PHC, 1995) noted that one of the causes of these diseases is inappropriate nutrition.

Obesity is also associated with many health problems. Obesity will increase the risk of diabetes, hypertension, lung function, back pain, surgical risk and osteoarthritis of the knee (Sunyer, 1993).

The PHC (1995) suggests diet related changes to decrease the risk of nutrition-related diseases, including obtaining energy balance, increase in fruit, vegetable, and calcium intake, and reduction of fat and sodium intake. Increase in fruits and vegetables consumption is associated with a lower risk of all cancer types (Block, 1992) and the reduction of fat and saturated fat intake reduces the risk of a number of diseases including ischaemic heart disease, obesity and diabetes (PHC, 1995).

2.2.2 Food and nutrition targets

In order to plan interventions to move the population's diet towards 'healthier' practices and monitor these changes, targets have been set for dietary intake including nutrient and food based targets (Ministry of Health, 1999). The Ministry of Health (MOH) proposed food-related targets with the recommendations for the increase in consumption of vegetables, fruits, bread and cereals (figure 2.1). These food-related targets were developed to reinforce the targets for nutrient intake as the MOH stated that people eat foods not nutrients.

Targets

Foods

To increase the consumption of bread and cereals so that 75% or more of the population are consuming at least six servings per day by the year 2000¹

To increase the consumption of vegetables and fruit so that 75% or more of the population are consuming at least five servings per day by the year 2000

Nutrients

To increase the intake of calcium so that 75% or more of the population (in particular children and adolescents) have a calcium intake greater than 600 mg per day by 2000.

To reduce the intake of total fat to 33% or less of the total dietary energy by 2005.

To reduce the intake of saturated fatty acids plus trans-fatty acids to 12% or less of the total dietary energy by 2005.

To reduce the mean dietary sodium intake to 140 mmol per day or less by 1997 and to 120 mmol per day by 2005.

To ensure that sucrose and other free sugars provide 15% or less of the total dietary energy by 2005.

Figure 2.1: New Zealand's Food-related health targets (The Ministry of Health, 1999)

Regarding the improvements of nutrient intake, the proposed outcome targets focus on the change of macronutrients intake with only one target focusing on micronutrient intake that is to increase calcium intake. The emphasis on macronutrients intake is due to the association between nutrition-related diseases and macronutrients intake (PHC, 1995; MOH, 1999). Comparably, the focus on micronutrients is to prevent diet deficiencies, such as the association between increasing calcium intake and the achievement of adequate peak bone mass to prevent osteoporotic fracture (Baran, 1989).

¹ The most recent nationally information of food and nutrient intakes is for the year 1997, so this review cannot yet assess the meeting of targets.

2.2.3 New Zealanders' food and nutrient intake

The following details of New Zealanders' nutrient intake are from the results of the National Nutrition Surveys (1989 and 1997). Although the Nutrition Taskforce (1991) guidelines include targets for variety of nutrients, including macro- and micronutrients, current diet related health concerns are related to macronutrient intakes because micronutrient intakes of most New Zealanders' were adequate (Russell et al, 1999). Therefore, this section is focused on macronutrients intake of New Zealanders compared to the Nutrition Taskforce Targets (1991) (Table 2.1).

The results of the 1997 National Nutrition Survey (table 2.1) showed that the percent energy intake from fat and saturated fat (35% energy from fat and 15% energy from saturated fat) have not met the guidelines (30-33% energy from fat and $\leq 12\%$ energy from saturated fat). Although there has been movement in the right direction between 1989 and 1997 in reducing the percent of energy from fat, there was also an increase in obesity levels from 11% to 17% during the same period (University of Otago/Hillary Commission, 1991; Russell et al, 1999).

Table 2.2: Macronutrients intake of New Zealanders compared to New Zealand Nutrition Taskforce targets (Department of Health, 1991)

Nutrients	1989		1997		Taskforce Targets (by 2000)
	Male	Female	Male	Female	
Energy (MJ)	10.4	6.8	11.6	7.7	
CHO (g)	266	184	305	214	
Fibre (g)	23	18	23	18	25-30
Protein (g)	85	57	105	71	0.8-1.6 g/kg body weight
Fat (g)	107	66	110	72	
SFA (g)	44	28	47	30	
PUFA (g)	13	8	15	10	
MUFA (g)	50	30	37	24	
P+M/S ratio	1.4	1.4	1.1	1.1	1.3-2.5
Cholesterol (mg)	296	193	359	243	
%E from CHO	42.4	45.2	45	47	>50
%E from protein	15.3	15.4	15	16	12-15
%E from fat	39	37	35	35	30-33
%E from SFA	16	16	15	15	≤ 12
%E from PUFA	5	5	5	5	6-10
%E from MUFA	18	17	12	11	10-20

There were also some improvements in the food consumption by New Zealanders. The progress toward food-related targets between the years 1989 and 1997 showed an increase in the percentage of New Zealanders who ate the recommended amounts of vegetables (54% to 67%) and fruit (27% to 46%). However, the percentage of New Zealanders who ate the recommended amount of bread and cereals decreased from year 1989 to 1997 (45% to 18%).²

2.3 Trends in food consumption

The results of the National Nutrition Survey (1997) show that about one-third of adult New Zealanders were trying to make dietary changes (39% females and 28% males). 'Trying to alter the consumption of high fat foods' was the most popular type of dietary change (22%), followed by 'trying to change the amount of fruits eaten' (14%) (Russell et al., 1999). These changes may be attributed to health related reasons.

Moreover, the New Zealand lifestyle has changed as more women are working outside of the home and people have become busier, resulting in New Zealanders tending to spend less time in cooking (Dekker, 2000). This has contributed to a steady growth in convenience foods, such as, ready-made meals, semi-prepared foods, and frozen foods (Syme, 1999; Leslie, 2000).

There is also a demand for healthier convenience foods, which has lead to an increase in sales for these products (Winters, 1999). Authors have described New Zealand consumers' trend towards healthy convenience foods, as resulting in a wider variety of 'healthy' foods, such as low fat yogurt, low fat milk, and muesli bars being produced (Winters, 1999; Leslie, 2001; Baker, 1993).

There have been changes in the New Zealand food supply with an increase in availability of 'healthy' products. These changes are likely to be attributed to consumers' increasing

² The difference in percentages of food and nutrients intakes may be due to the different methodology of conducting national nutrition survey for the year 1989 and 1997.

awareness of 'healthy' food consumption. However, some 'healthy' products are only niche products, e.g. low fat margarine and low fat cheese, which means the standard recipes of these products still dominate the market (Baker, 1993). This suggests that most consumers prefer to buy the standard products, so there are factors other than nutrition that influence the choice of food; these will be discussed in the next section.

2.4 Factors that affect 'healthy' food choice

The availability of healthy foods will not necessarily result in a healthy diet as long as less healthy options are also available. There are many factors involved in food choice in addition to availability, for example taste preference, the cultural and socioeconomic environment, and convenience (Lloyd, 1993).

People who make healthy food choices are likely to have good nutrition knowledge, favourable attitudes towards nutrition and use nutrition labels to make purchasing decisions (Mitchell and McLaughlin, 2000; Colavito et al, 1996; Guthrie et al, 1995). Nutrition knowledge may influence attitudes towards nutrition and the use of nutrition labels which in turn affects 'healthy' food choices (Tepper et al, 1997; Guthrie et al, 1995)

The barriers to 'healthy' food choices and the influence of nutrition information in purchase decision will be discussed in this section. Also there will be a discussion of factors that potentially influence 'healthy' food choices by looking at some behavioural models that have been used in research of food consumption (Sapp, 1991, Reynolds et al, 1999).

2.4.1 Barriers to 'healthy' eating

Although there is evidence that many people are aware of healthy diet guidelines, there are barriers to following the Nutrition Guidelines (Worsley et al, 1991). These barriers to 'healthy' food choice include taste preference, cost, lack of knowledge about food composition and personal attitudes towards changes to healthier diets.

Taste preference is one of the barriers to consuming healthy diets. The results of National Nutrition Survey (1997) showed that one-third of adult New Zealand population felt it would be hard to eat less fat foods because high fat foods taste good (Russell et al., 1999). Moreover, some consumers believed that low-sodium and low fat foods do not taste good (Buisson, 1995). Similarly, Veen et. al. (2002) noted that taste was an important predictor of added cooking salt for Dutch adults while concern about health aspects did not play a major role in salt intake.

Some food companies found that although consumers show a desire for healthier products, they are not prepared to trade-off taste preference to achieve this (Dickie, 1993; Baker, 1993). A breakfast cereal company in New Zealand claimed the slow growth of their products was because they had lower sugar content than the other brands and were therefore less preferred by consumers (Balasoglou, 1994).

Another barrier of healthy food choice is cost. Yee and Young (2001) noted that often low fat products developed by food manufacturers were not widely accepted because of poor taste and higher cost from small production runs. Similarly, 41% of US adults believed that healthy foods cost more than other kinds of food (Harnack et al, 1998). Therefore, some consumers prefer to buy 'standard' foods because they are cheaper.

Another barrier to following the Nutrition Guidelines was that people often have difficulty in translating the guidelines into food selection practices (Mitchell and McLaughlin, 2000). For example to put the guideline "choose foods low in fat" into practice knowledge of the nutritional composition of common foods is an important factor (Worsley et al, 1991). Previous study has shown that the awareness of links between nutrition and heart disease was widespread, but New Zealanders were confused about the fat and cholesterol content in foods (Wiseman, 1994).

Another issue is consumers' unawareness of the need to change their diets due to lack of recognition of the actual fat content in their current diets. Lloyd et al (1993) examined attitudes and beliefs of UK consumers regarding low fat diets. The results showed that

subjects were familiar with current guidelines concerning reduction of fat intake and had positive attitudes towards the guideline. However, regardless of their actual fat intake, which ranged from 26.7% to 49.2% energy from fat, the majority of people felt that their diet was healthy and not high in fat. They also indicated that they had already reduced their fat intake.

In some cases personal attitudes are a barrier to change. Crawford and Baghurst (1990) found that the majority of the Australian population perceived they had the knowledge necessary to make appropriate and effective dietary changes but it was the personal attitude (lack of will power) that prevented them from consuming healthy diets. These findings are contrary to the findings from Lloyd et al (1993) described above.

There are many barriers to healthy eating. The World Health Organization (1997) states that it may be difficult for consumers to stop eating the foods they like. Therefore approaches which both improve the nutritional quality of popular convenience foods and increase consumers' awareness of the importance of healthy diets, are likely to be more effective in promoting healthy food choice to the population.

2.4.2 The effect of nutrition information on healthy food choices

Nutrition labeling is one of the factors that could help consumers with making better decisions regarding 'healthy' food choices (Marshall, 1995).

The new label regulations which became effective in December, 2002 could help New Zealand consumers to make better food choice by requiring every packaged food to provide a nutrition label (Cumming, 2002).

Despite the potential usefulness of nutrition labeling, there is evidence in New Zealand that consumers do not understand how to interpret nutrition labels (Cumming, 2002). A study about how New Zealand shoppers read the labels showed that although 60% of shoppers claimed to read the nutrition information panel when they buy a product for the first time, only 22% of shoppers understood all the information on a nutrition label

(Prestwood, 2001). This study suggests that many New Zealanders were interested in reading nutrition labels, but it did not show if consumers based their final decision on information from nutrition labels when buying foods. Cumming (2002) noted that because reading nutrition labels is confusing and people don't have much time to spend when shopping for foods, price, convenience and cultural traditions continue to guide most purchases. Contradictory finding by Scott and Worsley (1997) shows that over two-thirds (68%) of New Zealand consumers claimed to put the food back on the shelves if it did not have the right amounts or kinds of nutrients which interested them. This study suggests that many consumers used nutrition labels in making purchase decision. However, it was not known if consumers used nutrition guidelines to guide their purchases or perhaps consumers have individual 'guidelines' that do not comply with government nutrition guidelines.

Government has a role to provide consumers with education about how to use nutrition information effectively to make healthy food choices (Smith, 2002). It is believed that if consumers use nutrition information wisely in making 'healthy' food choices, they will influence food manufacturers to produce products that will ultimately fit better with the Nutrition Guidelines (Prestwood, 2001).

2.4.3 Behavioural models

In order to systematically consider the influence of nutrition knowledge on the consumption of healthy products behavioural models have been used. Two examples of behavioural models that have been used in research regarding food choices are discussed below. These are the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the Social Cognitive Theory (SCT) (Bandura, 1986). Use of models allows identification of main factors relating to food practices and the causal relationships between these factors, this can help in the understanding of behaviour.

2.4.3.1 Theory of Reasoned Action (Ajzen and Fishbein, 1980)

This model identifies and links attitudinal and belief variables with behaviour, e.g. "healthier eating". It shows that two linked constructs, attitudes (personal feelings) and

subjective norm (social pressure), are central to the prediction of the intention to perform a specific behaviour (figure 2.2).

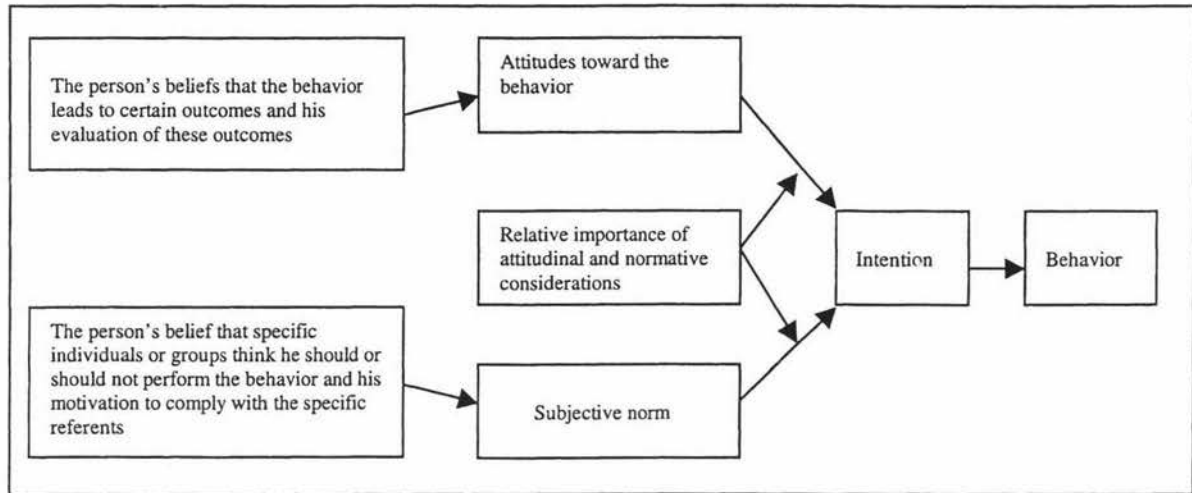


Figure 2.2: Theory of Reasoned Action (Ajzen and Fishbein, 1980)

The relative importance of attitudes and subjective norm has been found to differ depending on study population, the behaviour of interest, etc. For example, Anderson and Shepherd's research (1989) identified the beliefs and attitudes related to healthier eating of women who attended maternity hospital in UK. They found that attitudes toward 'healthier eating' were strongly predictive of intention and that these were more important than the subjective norms. On the contrary, a study by Verlegh & Candel (1999) found that subjective norms were a stronger influence on intentions than attitudes regarding the consumption of TV dinners.

The impact of nutritional knowledge has been examined in conjunction with the Fishbein-Ajzen model. Sapp (1991) noted that some studies used multi-attribute models as a means of examining the direct and indirect effects of knowledge in relation to attitudes, social support systems and behavioural intentions. Those studies show that nutrition knowledge affects intentions and behaviour primarily through its effect on attitudes and carries less relative impact than subjective norms and social-support constructs (Shepherd and Stockley, 1987; Lewis et al, 1989). These studies found little direct impact of nutrition knowledge on attitudes or behaviour. In comparison, other

studies have found the significant relationship between nutrition knowledge and attitudes (Schwartz, 1975; Grotkowski and Sims, 1978). Based on these studies, it can be seen that nutrition knowledge does not always correlate with attitudes or intention to perform a behaviour.

Sapp (1991) added nutrition knowledge into the Fishbein-Ajzen model to examine the impact of nutrition knowledge on beef-eating behaviour. Surprisingly, the results showed that nutritional knowledge was not directly related to intentions, behavior or attitudes. However, it was significantly correlated with social support constructs (i.e. influence of significant others and social acceptability), and these are significantly related to intentions and behavior. This study shows that the relationships between influential factors and behaviour are not always direct as one factor can affect another influential factor, which in turn affects behaviour.

2.4.3.2 Social Cognitive Theory (SCT) (Bandura, 1986)

Another model that has been used in predicting and explaining eating behaviour is Social Cognitive theory (SCT). The concept of the SCT is that behaviour, personal factors, and environment factors interact to explain and predict changes in behaviour and these relationships are reciprocal determinism (Bandura, 1986) (figure 2.3). All sources of influence are not equal in strength, which some sources of influence stronger than others and they do not all occur simultaneously. Environmental influences, such as family support, provide reinforcement for behavioural change. Personal factors, such as self-efficacy (i.e. belief in my ability to change behaviour) and outcome expectancies (i.e. belief in the positive and negative outcomes resulting from behaviour) provide direct influences on behavior. Behaviour itself, once enacted, can modify beliefs and directly influence the environment through the mechanisms such as meeting a new friend who supports the behaviour (Reynolds et al, 1999).

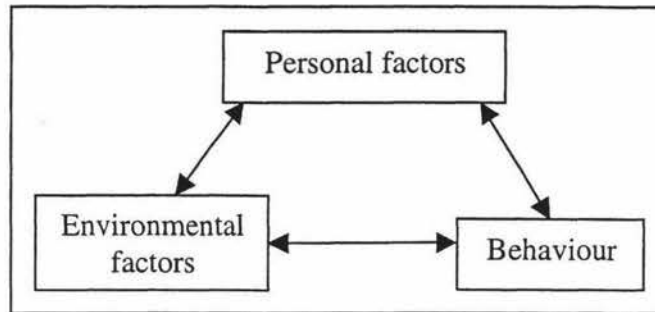


Figure 2.3 Social Cognitive Model : Reciprocal determinism (Bandura, 1986)

An example of a study using SCT to examine food choice is Reynolds et al (1999) who applied the SCT to propose a model for the prediction of factors related to fruit and vegetable consumption in elementary school children (figure 2.4). The proposed model included three environmental constructs (Availability, Modeling, and Nutrition Education), two personal constructs (Motivation & Knowledge), and a single behaviour construct (Consumption). The motivation construct was a latent variable composed of three separate measured constructs (perceived self-efficacy, outcome expectancies, and food preference). The arrows within the model indicated the direction of causal pathways. The results show that availability and motivation were most consistently related to fruit and vegetable consumption in elementary school children.

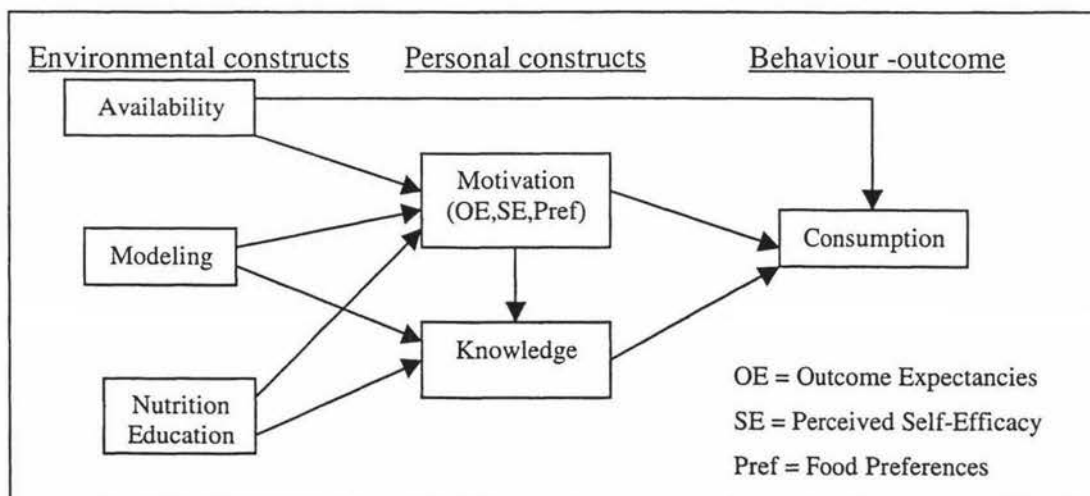


Figure 2.4: A proposed model based on the Social Cognitive Theory in the study of fruits and vegetables consumption in elementary school children (Reynolds et al, 1999)

Comparing the Fishbein-Ajzen model and Social Cognitive Model, they both include personal attitudes and influence of others. However, the advantage of Social Cognitive Model over Fishbein-Ajzen model in examining 'healthy' food choices is that SCT better includes factors which have been identified as being keys to choosing 'healthy' foods, such as self-efficacy and availability.

2.5 Role of the food industry in providing consumers with 'healthy' products

The improvement of New Zealanders' nutritional status could come from people's conscious decision to make changes, and this may be helped by the availability of 'healthy' food products. In addition, for people who are reluctant to make changes, the improvement of nutritional status could also occur by changes of nutritional quality in the existing food supply, with food choice staying stable.

The main driver in product development is sales/profit as noted by Shaw (1996) and product development is not usually aimed at improving public health. Therefore it is likely that 'healthy' products will be available only if consumers demand them.

Responding to consumer interest in nutrition, some food manufacturers have produced an option of healthy foods, such as low fat or low salt, etc (Baker, 1993). However, some consumers believe that low-sodium and low fat foods do not taste good (Buisson, 1995). One challenge for the food industry is to improve the nutrition quality of the food products, which are still acceptable to the consumers in term of taste. For example, Heinz manufacturers reduced salt and sugar levels in their products and conducted consumer tasting at every stage of reduction levels to make sure that the taste of products were still acceptable to consumers (Dickie, 1993). Another example is the use of artificial sweeteners in low fat yoghurt by a dairy company in New Zealand in order to gain consumers acceptance (Baker, 1993).

The attempt to produce healthy foods with good taste could lead to products with higher cost (Winters, 1999). Therefore, the healthy food option may be useful only for a group

of consumers who can afford to pay for premium quality but not for the general population.

Richardson (1995) suggested that the cumulative effect of small reductions of fat levels in a wide range of foods could have a significant impact on the achievement of the Health of the Nation fat targets in the UK. These changes require commitment/investment on the product development line because they may affect the development time and cost. The incentive to carry out small changes may also be low because a small reduction may not qualify for nutrition claims (Schaffner, 1998), so there is no marketing advantage in producing these products unless consumers compare nutrition information between products.

2.6 Nutrition in food product development

This section will include a discussion of how/where nutrition could be included in the product development process. Motivation for the inclusion of nutrition is also discussed.

2.6.1 Food product development process and the development team

The aim of product development research is to develop a product which consumers will buy (Schaffner et al, 1998). The system of research for product development suggested by Schaffner et al (1998) includes seven stages, each of which has a specific outcome (Table 2.3). Functional areas involved in new product development are marketing, research and development, engineering, manufacturing, sales and finance, etc.

The inclusion of nutrition in product development process may be started in stage one, at which point the company may set the project aims as making a product which comply with nutritional guidelines. The next stage, product idea generation, usually comes from advances in technology and from market/consumer needs (Schaffner et al, 1998). The market may recognize consumers' need to eat 'healthier' foods, so this may lead to a product's nutritional improvement. In stage three, the food technologist designs and tests the prototype product, at which stage different materials and processing conditions are investigated (Schaffner et al, 1998). If food technologists have personal interest in

nutrition issues and the nutritional improvement is not contrary to the project aims, they may try to improve the nutrition quality of their product at this stage, e.g. using low fat ingredients. The next stage that nutrition could be included in is marketing of the product. The product may be promoted for its nutritional benefits as a marketing advantage.

Table 2.3 : The product development process (Schaffner et al, 1998)

Stage	Interim analysis	Results
1.Project set-up		Aims, objectives, constraints
	Business strategy go/no-go decision	
2.Product idea generation and screening		Product concept and design specifications
	Critical analysis of product and target market	
3.Product design		Product prototypes
	Evaluation of technical success and costs	
4.Product testing		Final product, target market
	Evaluation of market success Quantitative analysis of market, prices, costs, investment	
5.Production and marketing development		Production system, marketing strategy
	Quantitative prediction of outcomes of launching	
6.Product launch		Consumer acceptance
	Analysis of sales, buying behaviour, marketing methods	
7.Postlaunch review		Product and/or market improvement
	Analysis of product quality	
Acceptance of new product into the product mix		

In summary, nutrition must be an integral part of the product development process for it to be successfully included as a product attribute. At the very least it must be part of the aims and objectives of a project and considered during product design and development by the product developer.

2.6.2 Factors that influence the development of nutritionally improved products

Factors that influence the consideration of nutritional improvements in existing products are discussed including profits/sales, company philosophy, government influences, personal interest, technological advances and market edge.

2.6.2.1 Profit/sales

Because a company exists to grow and be profitable, senior management follow a corporate business plan that will set out specific financial and growth objectives (Buisson, 1995). Examples of corporate objectives are to reduce manufacturing costs and to add value to niche products (Schaffner et al, 1998).

Due to an increase in consumers' health concerns, the development of nutritionally improved products may be considered as one of the company's objectives in order to maintain profits/sales.

2.6.2.2 Company philosophy

In order to promote the nutrient value of their products, food companies may want to adopt national nutrition guidelines as a company policy for all their products (Buisson, 1995). An example is that the Heinz company in the UK has a company policy which is to produce foods that comply with government recommendations (Dickie, 1993). The policy is aimed at reducing salt and sugar levels in their products

A recent example is that a US food company, "Kraft Foods Inc", announced that it will draw up nutritional guidelines for all its products, rethink some product recipes, reduce portions in some single-serve packages and encourage healthier lifestyles to help combat obesity (The Straits Times, 2003). In order to implement its healthier food program, Kraft will appoint an advisory council of experts in nutrition which would help in drawing up nutritional guidelines for all its products and also determine an appropriate serving size for single served products.

The example above suggests the importance of nutrition expertise in the nutrition consideration of the food companies. There is evidence that New Zealand food companies have to face the problem of lack of nutrition expertise when dealing with nutrition and health issues. A survey by Wiseman and McClean (1994) show that with twenty-nine New Zealand food companies being interviewed; only one company employed a full time dietitian or nutritionist. Thirteen companies used nutritionists or dietitians as a consultant. Nine had staff with some training including food technologists (five), nurses, home economist and one dietitian, while eighteen of the companies felt that it would be useful for at least some of their staff to know more about nutrition issues. But, five companies doubted the value of employing or consulting a nutritionist or dietitian. The sources of nutrition information that food companies cited were the National Heart Foundation, the Nutrition Foundation and the NZ Dietetic Association.

Thus, in order to include nutrition as part of a company's policy, the food companies may need some support from nutrition expertise, such as the National Heart Foundation, to guide their action.

2.6.2.3 Government policy

Government may influence the inclusion of nutrition in the product development process. The influence from the government can come from recommendations, consumer education and financial assistance.

- Recommendations

In New Zealand, the government's influence is generally by suggestion, not regulation. For example, the PHC (1995) recommends the food industry alter their products to enhance nutritional value. Of particular interest to them is the reduction of fat, salt and sugar in food products.

Because the influence from government is normally by recommendations, it may not be a strong influence on the food industry to develop their products accordingly. However, the government may influence consumers' demand for 'healthier' products through

education and increased awareness resulting in the food industry making changes in their product according to consumers' demand.

- Consumer education

An example of government suggestion to the food industry combined with consumer education is described by Yee and Young (2001). They describe support/motivation from Auckland Healthcare in the reduction of fat content in meat pies. A public health approach was used to raise the awareness of the food industry and consumers about the fat content in meat pies in Auckland, and to encourage pie manufacturers to produce lower fat pie choices. Media releases were sent to major newspapers, television, and radio stations in Auckland. The key campaign messages were 'pies are high in fat'; 'New Zealanders eat too much fat'; and 'manufacturers could make small reductions to the fat content of pies'. Seven pie manufacturers participated in the study; their pies were tested for fat content and they were sent the details of campaign encouraging them to develop low fat pies. Of the three pie manufacturers responding to the follow-up survey, only one manufacturer developed a low-fat pie range. Thus, the campaign was not really successful in directly altering fat content of pies, but it was successful in raising consumers' awareness of high fat content in pies. It may have also influenced the food environment with a greater availability of low fat pies because after the campaign, there was an increase in registration of low fat pies with the Heart Foundation's Pick the Tick program. In this time five companies developed 17 varieties of pies to meet the Heart Foundation's Pick the Tick program nutrition criteria.

- Financial assistance

The government may provide financial support for technical purposes, for example to determine the level to which unhealthy ingredients can be reduced while retaining the taste of products. An example is that the Nutrition Taskforces in the UK assisted the food industry to produce more acceptable low fat products by undertaking a "fat audit" approach. This approach helped identify the potential for more modest or marginal fat reductions across a wide range of products. These reductions are unlikely to have significant effects on technical functionality or on consumer acceptability (Richardson,

1995). A private/public partnership such as this could lead to the increased availability of healthy products that are acceptable to the general population.

2.6.2.4 Personal interest

Food industry professionals may use personal discretion in some aspects of the product development process; therefore their personal interest in nutrition could have an impact on the development. Personal discretion can be used as long as product development is not contrary to the company's objectives or consumers' acceptance and the development does not affect product qualities such as stability and shelf life. Any personal interest, e.g. nutrition improvements, may be difficult to pursue because food industry professionals also have limited resources, e.g. time and money.

No research on the role of personal discretion and nutrition in product development has been undertaken. But if nutrition were to be included as part of the product development process at personal discretion then this would require an interest by food industry professionals. There is research about the relationship of nutrition concerns of people involved in the food catering service and their nutrition practices at work. This is relevant because both food industry professionals and those in the catering industry have the role to develop and provide foods for consumers. Results of research examining personal attitudes regarding healthful food preparation of people involved in the food catering service are described below.

Reichler and Dalton (1998) examined whether chefs' and student chefs' attitudes, knowledge, and practices regarding healthful food preparation were consistent with the dietary guidelines for American. The results showed a lack of nutrition and food science knowledge among chefs, especially knowledge about fat and cholesterol. The relationship between attitude about nutrition and healthful food preparation was relatively positive. For example, the percentage of chefs who indicated a positive attitude toward providing more fruit and vegetable selections as part of menu offering (87%) and percentage of those responded that they always or sometimes likely to add more fruits and vegetables to menu items (78%) were similar. Both practicing chefs and student chefs thought that as

chefs they were responsible for the nutritional content of the food they prepared. However, the findings suggested that there were barriers to preparing foods according to US dietary guidelines, including the factors of taste, time, and training.

Another study in this area is a survey of nutrition knowledge and attitudes of hotel and restaurant management students in New Jersey (Hamm et al, 1995). The results showed that respondents' nutrition knowledge was fairly poor, especially regarding food composition, although their attitude toward nutrition was somewhat positive. But their beliefs about ingredients could be barriers to nutrition practices, for example they believed that salt and oil were important ingredients in attaining food's optimal and richest flavors. Therefore, it was less likely for them to reduce fat in their foods to improve nutrition quality. While respondents thought that nutrition was somewhat important in the food service industry, taste and flavor might be more important

The studies above showed that personal attitudes towards nutrition were not always related to healthful food practices as there were some barriers, such as nutrition knowledge and taste concerns. In these studies the respondents' nutrition knowledge was relatively poor, perhaps an increase in nutrition knowledge might increase personal awareness of diet and health concerns (Grotkoski and Sims, 1978). This increase in knowledge and awareness might result in motivation to prepare 'healthy' foods at home and work. Moreover, as respondents mentioned taste and time as the barriers to preparing healthy foods, increase in technical knowledge may assist them in the preparation of 'healthy' foods with good taste.

2.6.2.5 Technological advances

Technical advances have assisted in the product development of better quality products (Buisson, 1995). With the demand for healthier products, new technology has aided in meeting this perceived consumer demand, e.g. the new fibre in white bread, new compounds for fortification, and new fat and sugar substitutes.

Although some technological breakthroughs allow new products to be made, there are examples of technical problems still to be resolved in order to achieve 'nutritionally improved' products. For example, a study by Zoulias et al (2002) showed that the use of fat mimetic in the production of cookies resulted in products that were very hard, brittle and did not expand properly after baking. Also, products with fat mimetic had higher values of moisture content and water activity than the control, which could have effect on the product shelf-life. Muguerza et al (2002) found in the development of low fat fermented sausages that fat levels affected weight loss, the chemical composition, the gram negative bacterial count, the lightness, the texture and the appearance.

Thus, without technical knowledge, product developers could face the technical problems during the development of healthy foods, which may result in increased time and expense in product development process.

2.6.2.6 Market edge

The company's aim to develop 'healthy' products is generally based on a marketing strategy (McClean and Wiseman, 1995). As consumers have interest in 'healthy' products, such as low calorie, low salt, high fibre and low-cholesterol foods, many food manufacturers have developed more 'healthy' foods to gain market advantage (see section 2.2) (Baker, 1993; Winters, 1999). For example, a survey of 41 New Zealand food companies regarding their attitudes towards the Pick the Tick program, show that the advantage they found in joining the program was good publicity for their product, an advantage in marketing and raising public awareness of the company's commitment to nutrition (McClean and Wiseman, 1995). (The Pick the Tick program provides nutrition expertise in developing products that comply with New Zealand food and nutrition guidelines with an associated cost)

The other marketing factor is the competition. The launch by a competitor of an improved product requires some reaction from companies with products whose sales may suffer from this introduction (Buisson, 1995). For example, all breakfast cereals are now fortified with vitamins and minerals due to competitiveness (Pehanich, 2003).

2.6.2.7 Summary

Six possible ways that nutrition improvements of food products may be influenced were identified. Food companies may be influenced by government, technological advances, and also personal interest in nutrition. Additionally, they may be influenced by the market trend of increased health concerns, profits/sales, or a nutrition policy for all their products. However, their perception of consumer desires for 'healthy' products may differ depending on their segment of the consumer market. For example, the food companies that sell products targeted at children may not consider fat reduction in their products because fat concern is not a big issue for their targeted consumers, whereas the companies which sell products targeted at health conscious women, will consider fat reduction in their products.

2.7 Conclusion

The diet related health problems of New Zealanders are still significant. The diet of New Zealanders is not meeting the New Zealand Nutrition Guidelines and the trend of diets is moving towards processed foods which in general are higher in fat and sugar and lower in fibre and nutrients than recommended.

Based on the behavioural models, there are many factors potentially influencing to 'healthy' food choices, such as nutrition knowledge, attitudes towards nutrition, and significance of others. The strength of the influence of these factors is different based on the study population, the behaviour of interest, etc. The influential effect of those factors may be weakened by the barriers to 'healthy' food choices, such as taste preference and knowledge of food composition. Therefore, the government has proposed the recommendations both for consumers to make 'healthy' food choices and for the food industry to provide consumers with 'healthy' food products.

The food industry has taken part in producing 'healthy' food products such as low fat and low salt products based on consumers' demand. This can be done either in the form of the healthy food options or small overall changes in standard foods. The option of healthy food choice would be effective for consumers who have quite strong concerns about

nutrition related to health and are affordable to pay for premium quality. On the other hand, the small overall changes would be useful to consumers who cannot pay extra for more expensive nutritious foods and for consumers who do not base food purchase decisions on nutrition.

Nutrition may be considered at different stages in the product development process. The company may consider nutrition as one of the project aims; the food technologists may consider nutrition improvements during the development of prototype products; and the marketers may promote nutrition as one of their product benefits. The consideration of nutrition during the set up of the project aims and the marketing of products is likely to be the result of consumer/market research, while nutrition consideration during the product design may be influenced by consumers as well as due to personal discretion, and technical knowledge of food industry professionals. Other factors which lead to the consideration of nutrition in product development include to increase profits/sales and to develop products that comply with government policy are also basically based on consumer demand.

It is clear that consumers' health concerns have influenced the development of nutritionally improved products. However, the importance of a personal interest in nutrition of food industry professionals has not been examined. A better understanding of factors which may potentially influence the inclusion of nutrition in the product development process is an important step in identifying strategies to promote the development and availability of 'healthy' products.

3. Project Outline

3.1 Introduction

This description of the project outline includes project aim/objectives, the use of the social cognitive model, and overall project description.

3.2 Project aim/objectives

The aim of this study is to examine factors potentially influencing practices by food industry professionals to improve the nutritional quality of food products.

The objectives are:

1. To determine the frequency food industry professionals carry out nutrition enhancing practices in the home and work environment and to examine factors influencing these practices.
2. To examine the usefulness of the social cognitive model.
3. To examine the difference of survey responses via the use of paper-based and web-based survey.

3.3 Proposed model

Social Cognitive Theory (SCT) is chosen as a guide model for this study. Social Cognitive Theory proposes an interaction between the environmental and personal factors to determine behaviour. It is useful in this study because of the interest in the importance of personal factors and environment/institution factors in determining nutritional improvements in food product development. An understanding of which factors are important will help identify how/where to intervene to improve nutritional quality of food supply.

The personal factors included in the model are nutrition knowledge, attitudes towards nutrition and confidence in one's own ability to improve the nutritional quality of foods

(self-efficacy). Nutrition knowledge is believed to influence attitudes towards nutrition and, in turn, affect food choices. This has sometimes been shown to be the case with individual food practices, the main question here is whether or not it will influence food practices in the work environment, e.g. will it be associated with developing foods which are more nutritionally beneficial. Likewise, attitudes towards nutrition have sometimes been shown to be associated with nutrition enhancing practices. Lastly, self-efficacy is considered in the model in order to determine whether it is a barrier to nutritional improvements of food products.

Environmental factors included in the model are nutrition education and the perception of the company's and the consumers' views towards the development of nutritionally enhanced products (These latter two are subjective norms). Nutrition education is hypothesized to increase the food industry professionals' nutrition knowledge and possibly lead to changed attitudes. It may also increase their confidence of how to alter a product to enhance nutritional value (i.e. their self-efficacy). Subjective norms are believed to be influential to nutrition related practices because people sometimes perceive a pressure from other people which affects their food behaviour, which in this case may be in the work environment as well as at home.

Consideration of nutrition in relation to food products may be different for the home and work environment. There may be constraints in the work place, such as the company's objectives, time and money, so in this study nutrition enhancing practices are examined separately for the work and home environment. Nutrition enhancing practices at home are hypothesized to be related to nutrition enhancing practices at work because both of them may be due to personal knowledge, attitudes, etc. However, there might be some differences between these two environments due to constraints from workplaces, e.g. cost and time. The proposed model for this study is shown in figure 3.1.

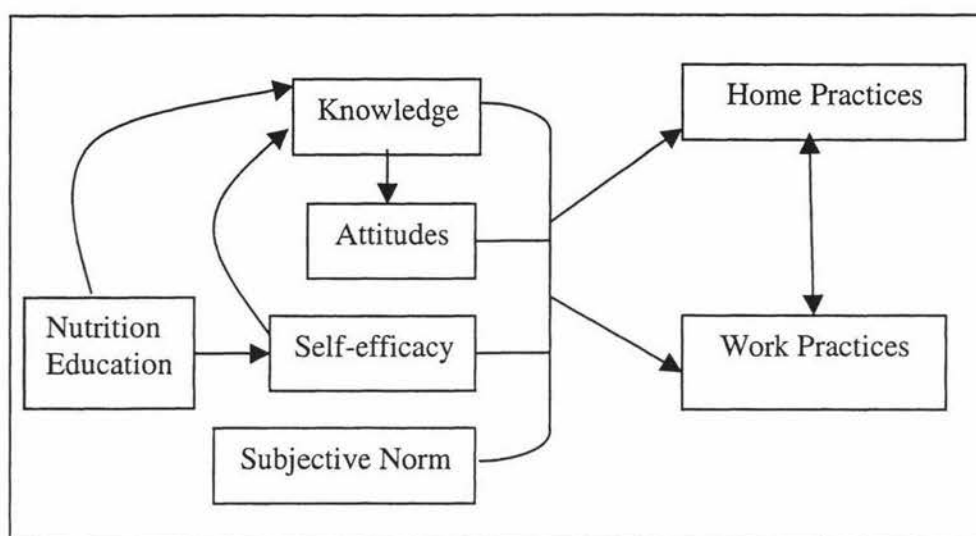


Figure 3.1: Proposed model for this study

3.4 Overall project description

This project consists of two stages. The first stage is a quantitative survey of a group of food industry professionals to collect information related to nutrition enhancing practices and other variables in the model. This survey is followed by in-depth interviews for a subsample in order to examine in more depth the information obtained from the survey.

3.4.1 Questionnaire survey

The quantitative survey was designed to be a self-administered mail survey because this method is convenient for surveying people in different geographic areas around New Zealand (Holbert & Speece, 1993).

Because of the time constraints for the research, an internet survey was also considered to be useful because of two main points. One point is that the internet may be easier for the respondents to access and administer and therefore will possibly result in a better response rate and even possibly better quality data. It has been suggested that internet survey response rate is widely varying from 15-80% (Webpoll, 2003). The other point is that the internet survey is easier and perhaps quicker for the researcher because it reduces time to prepare and send the survey compared to the paper survey, the response is

immediately received and the data may be directly entered in the database for analysis. In order to find out if these advantages would exist for this population, this survey was conducted with some respondents asked to reply via the internet and others to fill out survey form and mail in. The response rates and item non response rate were compared between the two methods (Manfreda, 2001).

Areas included in the survey were questions examining nutrition knowledge, nutrition attitudes, the confidence of one's own ability to improve nutritional quality in food products (self-efficacy), the perception of the company's and the consumer's views towards nutrition consideration (subjective norms), and frequency of nutrition enhancing practices at home and at work.

It was hoped to get a representative sample of food industry professionals in New Zealand by using the mailing list from the New Zealand Institute of Food Science and Technology (NZIFST). However, the access to the list of NZIFST was not permitted. Therefore, other possible ways to recruit respondents were considered.

First, it was considered to put an advertisement in the NZIFST branch newsletters, asking for the food industry professionals who are interested in the survey topics to reply stating their interest and then the survey would be sent to them. However, this way was considered to be too time-consuming, and would have perhaps resulted in a low number of respondents. Another possible way to recruit respondents was by using a mailing list of the food industry compiled from telephone books. This way was believed to be more time-saving than the use of an advertisement because the respondents could be sent the questionnaire rather than have to request it and then have it sent back, although using the telephone books the respondents' names are not known. Direct contact (i.e. sending a survey to a named person) was anticipated to result in a better response than non direct contact (DSS Research, 2003), so telephone calls were made to all food companies selected from the phone books to ask for the names of the food technologists working with them.

3.4.2 In-Depth Interview

The in-depth interview was conducted to explore and clarify the findings from the questionnaire survey. It was qualitative research designed to get more information in order to understand more about the context in which nutrition enhancing practices occur (Caps Exchange, 2003).

A subsample of the surveyed population, which encompassed all of the respondents who indicated willingness to participate in further study, was contacted for the interview. Areas of interview questions were designed based on the survey results including the exploration of sources of messages and/or the reasons why some factors were/were not related to work practices enhancing nutrition.

Due to the barriers of time and cost required to travel a long distance, the interview was conducted in person only for those respondents close to Palmerston North. The remainders of the in-depth interviews were carried out by telephone.

3.4.3 Ethics

Every research involving human participants conducted by students of Massey University is required to be consistent with Section 6 of the Education Act 1989. The major ethical principles are respect for persons; minimisation of harm to participants, researchers, institutions and groups; respect for privacy and confidentiality; the avoidance of unnecessary deception; research adequacy; informed and voluntary consent; avoidance of conflict of interest; compensation for participants; respect for property rights; social and cultural sensitivity to the age, gender, culture, religion, social class of the subjects; and justice (Massey University, 2003).

The ethics application was submitted to the Massey University Human Ethics Committee for consideration and approval before the survey was sent to the potential respondents. The Ethics committee's request was to consult the director of Information Technology Services, Massey University regarding use of web sites for completing questionnaires and to ensure that the respondents' contact details are on a separate page from the

questionnaire. The application was approved and the statement that this project has been reviewed and approved by the Massey University Human Ethics Committee was included in the information sheet and the questionnaire.

3.5 Summary

The research objectives were addressed using a two stage research design. The first stage was a quantitative questionnaire and the second stage was an in-depth interview. Social cognitive theory was used to build a model of expected influences on nutrition enhancing practices and this informed the choice of questions/variables. Variables examined include nutrition knowledge, nutrition attitudes, confidence in one's own ability to improve the nutritional quality of foods (self-efficacy), the perception of the company's and the consumer's views towards the development of nutritionally enhanced products (subjective norm), and nutritionally enhancing practices at home and at work (outcome variables). The results of these variables were then analysed for their relationships based on the model. Issues relating to obtaining a suitable sampling frame were considered and the respondents were recruited by using a list of the food industry from the telephone books. Another issue considered was the use of web-based survey. In order to examine this the respondents were divided into two groups and sent either web-based or paper-based surveys in order to compare the effectiveness of conducting a survey via these two methods.

The overall project description was submitted to the Human Ethics Committee at Massey University for ethical consideration and approval before the survey was sent. The survey findings were then used for designing the in-depth interview questions in order to clarify the findings from the questionnaire survey. Interview participants were a subsample of the survey population who volunteered to be interviewed. The interview questions examined why some hypothesized factors were/were not related to work practices considering nutrition.

4. Methods

4.1 Introduction

This chapter describes the two parts of the study. The first part is the questionnaire survey and the second part is the in-depth interview expanding on topics in the questionnaire.

4.2 Questionnaire survey

The process of conducting the questionnaire survey is described in the following sections including sample selection and recruitment, the questionnaire design, pretesting, administration and analysis.

4.2.1 Sample

Food industry professionals in New Zealand were selected from telephone books under the category of “food manufacturers and confectioners”. A purposive cluster sampling strategy was used, in that phone books for only some areas in New Zealand were used. The areas chosen were the main sites of food companies (Auckland and Canterbury) and other areas in order to get widely distributed areas around New Zealand (Manawatu, Wellington, Bay of Plenty, Otago, Nelson and Bays and Southland). These eight phone books were out of a total of eighteen regional phone books for New Zealand.

Every food manufacturer (n=196) and confectioner (n=90) from the telephone list in those books (total=286) was included in the sample.

Because direct contact, e.g. using a personalised letter to the survey recipient, is one technique that is believed to improve the response rate of mail survey (DSS Research, 2003), every food manufacturer and confectioner identified from the telephone list (total=286) was called and asked for the names of food technologists working with them. As a result of the phone calls, 54% of the companies were excluded for the following reasons: companies that indicated they had no food technologists, companies that were not interested to do the survey, companies that were not manufacturers, and cases where there was no answer to the phone call (repeated busy signal, no answer, phone number

was not in service). This resulted in 95 companies that provided names of food technologists.

This number of potential respondents was still lower than desired and raised concerns about the total number of actual respondents. (The minimum sample size was 100 companies because at least 30 responses were needed in order to get medium reliability of statistics (Holbert and Speece, 1993). The response rate of mail survey is generally low, it can be around 30-35% (DSS Research, 2003)). Therefore, an effort was made to increase the overall number of respondents by sending surveys to the 36 companies for which several attempts were made to contact them but there was no answer or lines were busy. The letters sent to these companies was with the indication 'To food technologists'. Thus 131 companies were sent letters as a result of the search through the phone books, of these 109 surveys were sent to food manufacturers and 22 to confectioners.

The list of the food companies in the telephone books does not cover the food ingredients suppliers. In order to get a cross section of the food industry in New Zealand surveys were also sent to all food ingredients suppliers identified from the book "Food Technology in New Zealand 2000" (n=68). Due to the time limitation, these food ingredient suppliers were not called to ask for the names of food technologists, but all food ingredient suppliers in the list were sent the survey with the indication 'To food technologist', resulting in 68 more potential respondents selected as the sample for this study. Thus, a total number of 199 potential food companies were identified for this study.

4.2.2 Recruitment

Letters were mailed to all 199 potential respondents informing them about the study and asking them to participate (appendix 4.1). In order to meet the research objectives to examine response rate between internet and paper based surveys, the potential respondents were divided into two groups based on odd or even numbering. One of two different sets of information was sent to each group. Those with odd numbers (100 respondents) were sent an information sheet about the paper based questionnaire

(appendix 4.2), a reply paid envelope and the paper questionnaire (appendix 4.3). The other half (99 respondents), with even numbers, was sent the invitation letter including the web site address (URL) (appendix 4.1) of the web-based questionnaire and the information sheet (appendix 4.2). The web based questionnaire is identical to the paper based questionnaire.

The survey was carried out between 6 November-7 December 2002.

To encourage responses, respondents were offered a chance to win a book voucher for questionnaires completed and returned within one month.

Two weeks after the first letters were sent, follow up letters (appendix 4.4) were sent to the respondents who had not replied to the paper survey to encourage more responses. Those who had been asked to complete the web-based survey were all contacted with follow-up letters because there was no code number on the web questionnaire, therefore the researcher could not track the respondents who had already replied to the web survey. Eighteen (18) responses were received before the follow-up reminders and 28 responses after the follow-up reminders.

4.2.3 Self-administered questionnaire

The questionnaire was developed for the measurement of variables identified by the model. The questionnaire included sets of questions designed to examine nutrition knowledge, attitudes towards nutrition, confidence in one's own ability to improve nutritional quality in food products (self-efficacy), the perception of the company's and the consumer's view towards developing nutritionally modified products (subjective norms), and nutrition related food practices at home and at work (outcome variables).

There is a broad range of issues related to nutrition and respondents may have different interest or concerns for different aspects of nutrition (Scott and Worsley, 1997), for example they may be concerned about fat or vitamins, but not about sodium. Therefore

the questionnaire was designed to include two different aspects of nutrition; fat, sodium, as well as general nutrition.

The questionnaire was developed as paper format and web format, which were identical in contents and style. The paper questionnaire was created using Microsoft Word document and the web questionnaire was created and coded using the program 'Dreamweaver' (Warner & Vachier, 2001) and 'Active Server Pages (ASP)' (Bellinaso & Hoffman, 2002).

4.2.3.1 Variables measurement and scaling methods

Definition of variables, areas of questions and also the scaling methods are discussed below.

Nutrition knowledge: The nutrition knowledge construct relied upon two sets of questions. Previous research suggests including questions on both nutrition facts and nutrient content in determining nutrition knowledge (Sapp, 1991; Colavito, et. al., 1996). Sources of nutrition fact questions were from previous studies (Reichler and Dalton, 1998; Hamm et al, 1995; Kearney et al, 1998; Cyper et al, 1996). Nutrition facts questions (question1a-n) included 14 true-false questions about food and health. Nutrient content questions (question2) were made up in the form of ranking test for the fat, fibre and sodium content of foods (12 questions). The information about food composition was obtained from the book "NZ Food Facts" (Department of Health, 1991).

Nutrition knowledge questions included general knowledge as well as questions regarding fat and sodium. Eight questions examine nutrition knowledge regarding fat (questions 1a, b, d, e, and question2-ranking of fat content in four foods), Five questions are regarding sodium (question 1l, and question2-ranking of sodium content in four foods) and there are thirteen general nutritional questions (questions 1c,f-k,m,n, and question2-ranking of fibre content).

Respondents got one point for each knowledge question that they answered correctly.

Overall nutrition knowledge score was measured by summing the correct answers to the tests on nutrition facts and nutrient content (total score= 26). A high score means greater nutrition knowledge. Scores are also calculated separately for the fat and sodium knowledge items.

Nutrition attitudes: Questions regarding attitudes towards nutrition were based on previous research including aspects of attitudes toward 'healthier' eating, the use of nutrition labels and attitudes toward improvement of the nutrition quality of food products (Kearney et. al., 1998; Colavito, et. al., 1996; Reichler and Dalton, 1998; Hamm et. al., 1995). A 5-point Likert scale was used to measure attitudes towards nutrition (strongly agree-strongly disagree).

There were 20 questions examining attitudes towards nutrition (question 3a-e, g-j, l-s and questions 8 d, f & h), with six questions examining attitudes regarding fat reduction (question 3 i,j,l,o,s and question 8d), two regarding sodium reduction (question 3g and question 8f), two regarding nutrition labels (question 3a,b), and ten related to general nutrition issues (questions 3c-e,h,,m,n,p-r and question 8d,f,h).

Overall the nutrition attitudes score was measured by summing the responses from attitude statements, where positive statements were scored from 5 (strongly agree), to 1 (strongly disagree), while the reverse scoring is used for negative statements. High scores indicate favourable attitudes toward nutrition. Scores are also calculated for attitude towards fat, sodium and nutrition labels.

Self-efficacy: Confidence in one's own ability to improve nutritional quality of food products (self-efficacy) was assessed in relation to home and work practices including general nutritional issues, fat reduction and sodium reduction.

There are 5 questions examining confidence in one's own ability to improve the nutritional aspects of food at home and work (question 3 f, k, question 8e, g & i). Two of these questions examined confidence in one's own ability to reduce fat in foods (question

3f and question 8e), two ask about ability to reduce sodium in foods (question 3k and question 8g), and one examines the confidence to improve general nutritional aspects in foods (question 8i). A 5-point Likert scale was used to measure self-efficacy.

Overall self-efficacy score was measured by summing the responses from all questions. A high scores mean higher confidence in own ability to improve nutrition aspects in products

Subjective norms: The perception of other's view towards developing nutritionally improved products (subjective norms) was measured by the perception of the company's and the consumer's views towards general nutrition aspects, fat reduction and sodium reduction.

There were 6 questions examining the perception of the company's and the consumer's views towards developing nutritionally improved products (questions 8 a,b,c,j,k & l). Two questions each are for examination of importance of the company's and the consumer's views towards fat reduction (questions 8 a & j), sodium reduction (question 8 b & k), and general nutrition aspects (questions 8 c & l). Three questions are related to the perception of the company's view (questions 8 a,b,c) and three are related to the perception of the consumer's view (questions 8 j,k,l) towards developing nutritionally improved products. Questions used a 5-point Likert scale.

Overall subjective norms score was measured by summing the responses from all questions. A high score means more perceived support from the company and consumers in developing nutritionally improved products.

Nutrition enhancing practices at home: Questions on nutrition enhancing practices at home were taken from previously published sources (Colavito, et al, 1996; Reichler and Dalton, 1998; Hamm et al, 1995) including nutrition related food practices regarding the reduction of fat and sodium intake and the use of nutrition labels.

There were 14 questions examining nutrition related food practices at home, of which nine questions examined practices at home regarding fat reduction (questions 9 b-g, i, k & m), three regarding sodium reduction (questions 9 a, h & l), one regarding the use of nutrition labels (question 9n) and one regarding general nutrition aspects (question 9j).

The frequency of nutrition enhancing practices was measured on a 4-point scale from 'never' to 'often'. Overall the nutrition enhancing practices at home score was measured by summing the responses from all questions, positive statements are scored from 3 (often) to 0 (never), while the reverse scoring is used for negative statements. A high score means greater frequency of nutrition related food practices.

Nutrition enhancing practices at work: Nutrition enhancing practices at work were measured by asking respondents to report the aspects of nutrition related work practices that they have done, and the frequency with which they have carried them out. Questions were asked regarding practices when 1) developing, 2) reformulating and 3) marketing a food product. Within each role, respondents were given a list of common aspects of nutrition related practices to choose from, including: addition of fibre, addition of vitamins and minerals, fat reduction, sodium reduction, alteration type of fat, and they were also given an option to report 'other' aspects of nutrition practices not included in the list.

There were 18 questions examining nutrition related practices at work (questions 13 a-f, questions 15 a-f and questions 17a-f). Three questions each examined the aspects of fibre addition (question 13a, question 15a and question 17a), addition of vitamins and minerals (question 13b, question 15b and question 17b), fat reduction (question 13c, question 15c and question 17c), sodium reduction (question 13d, question 15d and question 17d), fat alteration (question 13e, question 15e and question 17e), and other nutrition aspects that respondents have done (question 13f, question 15f and question 17f).

Frequency of nutrition related food practice was measured on a 4-point scale from 'never' to 'often'. Overall the nutrition enhancing practices at work score was measured

by summing the responses from all aspects of practices. A high score means greater frequency of nutrition related food practices.

Open-ended questions: Open-ended questions were included in the questionnaire because they give the respondents opportunity to express their personal opinions/comments about nutrition issues. These questions include asking what advice they would give to university students about how to stay healthy and live a long time; asking about the good and bad aspects of their own diets; and finding out the sources from which they get nutrition information.

The answers from the open ended questions were used to help in the explanation and clarification of the findings from the close ended questions, e.g. respondents' nutrition concerns and sources of nutrition knowledge.

Company information: Details about the company the respondents worked for were asked in order to determine their relationships with variables identified by the model. They include the types of products developed in the company, the respondents' positions in the company, the existence of a written nutrition policy and the size of the company.

Demographics: Respondents were also asked to give their demographic details of age, gender, education level and amount of previous nutrition education. These are summarized to give a description of the sample. They are also examined in relation to variables in the model.

4.2.4 Pretesting

The questionnaire was pre-tested for wording, understandability, the variance of test items and timing with 14 subjects; 5 food industry professionals and 9 students at Massey University. The length of time used to complete the questionnaire was 10-30 minutes. The pretest questionnaire is shown in appendix 4.5.

After pretesting, it was found that all pretested respondents had high nutrition knowledge scores which imply that the test could not discriminate the nutrition knowledge level of respondents. Therefore, the questionnaire was revised by adding more advanced nutrition fact questions; these were expected to increase the discriminate validity of the test (Axelson and Brinberg, 1992). The advanced nutrition fact questions came from publications about nutrition on a New Zealand health website (Everybody, 2002).

Respondents involved in the pretesting said the evidence of some nutrition “facts” was not confirmed so it was difficult to answer these questions. To address this concern the wording of some nutrition knowledge questions was changed to acknowledge lack of certainty by adding possibility words (such as “may be”) to replace confirmation words (such as “can or help”). Moreover, respondents said the questions about nutrition attitudes at work should include wider aspects of nutrition in addition to aspect about sodium, such as fat and sugar. They also suggested, in addition to influence from the company, the inclusion of influence of consumers on nutrition enhancing practices at work. As a result of this feedback more questions were added about nutrition attitudes at work including more aspects of nutrition and influence from consumers. The questionnaire format was also changed to be more concise in order to prevent the respondents feeling put off from the lengthy questionnaire. The final questionnaire is shown in appendix 4.3.

4.2.5 Questionnaire analysis

The responses for each question obtained from the paper questionnaire were entered into a Microsoft Excel (1998) spreadsheet. The input of web survey data into a spreadsheet was similar to the paper survey. The web survey responses could not be directly entered into a spreadsheet because they had to be adjusted for negative/positive questions. Therefore, the data obtained from the web-based survey was copied into notepad files and the data was printed out into a paper form. The responses were then entered into Microsoft Excel spreadsheet. However, the open-ended answers and comments from the web survey could be put directly from the files of web survey to the spreadsheet.

The data from the paper and web based surveys were combined in the same excel spreadsheet with a variable indicating the sources of the data.

The Microsoft Excel program was used to calculate scores for the variables, e.g. nutrition knowledge, attitudes, etc. Then the scores were described by frequencies, ranges, means and standard deviation. This analysis was done for overall scores and scores of different aspects in relation to fat and sodium. The demographic and company details were coded and analysed for frequencies.

Data from the web based and the paper based survey was compared for number of questionnaires returned (response rates) and item nonresponse (number of blank answers).

The open-ended answers were analysed by grouping the answers into similar issues and looking for the frequency of the most commonly reported issues in each question.

The variables in the model (scores for nutrition knowledge, attitude, self-efficacy, subjective norms and outcome variables) were put into SPSS (version 11) spreadsheet to test the model. First, bivariate relationships between independent variables were examined using regression analysis in the SPSS program. Then the model was analysed using regression analysis as well. The analysis was done for the full model (overall scores) and for the partial models (scores in relation to fat, sodium and nutrition label).

Analysis of variance (General linear model) in SPSS was used to examine relationships of variables in the proposed model with demographic and company details.

The variables were also tested for internal consistency reliability using cronbach's alpha. The range of alpha coefficient is from zero to one, which the higher the coefficient the better the internal consistency (Rosnow & Rosenthal, 1996).

The P-value of $P \leq 0.1$ is used to indicate significance in this study because this is a small exploratory study.

4.3 In-depth interview

The interview was aimed to clarify the results of the questionnaire survey and obtain more detail in relation to frequency of practices regarding nutrition related issues and factors related to these practices, including personal attitudes towards nutrition, company's nutrition policy and labeling regulation.

4.3.1 Sample

When answering the questionnaire, 20 respondents indicated a willingness to be interviewed. These respondents were mailed the interview information sheet (appendix 4.6), and then contacted by telephone. Due to the time lapse between the two surveys, only 12 respondents were available for the interview. The reasons that respondents were not able to participate in the interview were that some of them had moved the jobs and some of them indicated that they were too busy at the time so they did not have time for the interview. Two respondents who lived near Massey University (Palmerston North and Wellington) were interviewed in person and ten respondents who live farther away were interviewed by telephone.

4.3.2 Interview schedule

The findings from the survey were used to design the interview schedule. The topics covered in the interview include the importance of nutrition for the companies that the respondents worked for and why/how the respondents assessed this importance; examples of nutrition related food practices that respondents have done at work; the perceived/experienced benefits and problems from altering a product to enhance nutritional value. Respondents were also asked about potentially influential issues related to their nutrition enhancing practices including their personal nutrition attitudes, concerns towards nutrition, the effect of new labeling regulation and why these issues were related/not related to their work practices (appendix 4.7).

4.3.3 Pretesting

The interview was pretested for understandability and timing with 2 food industry professionals on the telephone. The interviews were tape recorded using an answering machine and tapes were reviewed by using a cassette player to listen to the interviews. The interviews were then transcribed and typed into Microsoft Word document. Based on the transcription, wordings of some questions were changed to be more understandable. The length of time used to complete the interview was 15-20 minutes.

4.3.4 Interview administration

The interviews were carried out between 7-13 November 2002. Before conducting the interview, respondents were informed that the interview will be tape recorded and that the main topics of the interview included the company nutrition policy, attitudes and practices regarding nutritional enhancing practices, and attitudes and practices regarding the use of nutrition labels. The interview schedule was used during the interview. Interviews were tape recorded using a tape recorder for the one-on-one interviews and an answering machine for the telephone interviews. Respondents who were contacted in person (n=2) were asked to sign a consent form before the interview started, while respondents who were contacted by telephone (n=10) were informed that their participation in the interview implied their consent for this study.

4.3.5 Interview analysis

The taped interviews were transcribed and typed into Microsoft Word document. Because the full transcription is time consuming, ten interviews were transcribed as notes using as much verbatim materials as possible (Hoinville and Jowell, 1977), while two interviews were transcribed in full. The write-ups of the interviews were read as a whole to gain an overall view of their contents. Then the specific topic areas were selected and only the sections of interviews were read (Hoinville and Jowell, 1977). The selection of topic areas was suggested by the objectives of the study and answers for each topic area were noted into Microsoft Excel spreadsheet to look for themes of different aspects of nutrition issues.

4.4 Summary

The list of food manufacturers and confectioners from the telephone books and the list of food ingredient suppliers from the book 'Food technology in New Zealand 2000' were used as the contact details of potential respondents for the questionnaire survey. The survey was sent to them as web based and paper based survey in order to compare the responses. The questionnaire was designed to examine variables defined by the model and the data were analysed using computer based program to look for relationships between variables and to test the model. The survey findings were clarified in the interview with the subsample of the questionnaire survey who volunteered to be interviewed. The interview results were then analysed to look for themes and overall findings were discussed for the explanation of results and main findings.

5. Questionnaire Survey:

Results and discussion

5.1 Introduction

The quantitative survey was used to examine the study model (Figure 3.1). This chapter presents survey results including descriptive details, scores of outcome variables, comparison of responses between web and paper based survey and analysis of the model. Discussion of these results is also included in this chapter.

5.2 Descriptive information

There were 46 responses from the 199 surveys sent (23% response rate). The response rate for the different types of companies are: 28 of the 109 sent “food manufacturers” (26%); 5 of the 22 sent to “confectioners” (23%) and 12 of the 68 surveys sent to “food ingredient suppliers” (18%). The lower response rate from the food ingredient suppliers compared to other types of food companies is likely to be because there were no contact names of respondents for the surveys sent to food ingredient suppliers which may resulted in lower motivation to reply the survey.

The following section is a summary of the respondents’ demographic, company and work details. It also includes description of responses to the open ended questions and scores for the independent variables in the model.

5.2.1 Demographic information

The distribution of gender, age group, education levels and nutrition education is shown in Table 5.1.

Table 5.1: Respondents' demographic information

Demographic factors	Respondents	
	Number	Percentage
Gender		
- Male	24	52
- Female	22	48
Age (Years)		
- 20-30	10	22
- 31-40	7	15
- 41-50	12	26
- 51-60	1	2
- blank	16	35
Education		
Secondary	5	11
Undergraduate	34	74
- Food technology	11	24
- Food science	6	13
- Diploma	4	9
- NZCS	2	4
- BSc	2	4
- Other*	9	20
Postgraduate	7	15
- Masters	3	7
- Diploma	1	2
- PhD	1	2
- Blank	2	4
Nutrition education		
- 0 paper	30	65
- 1 paper	9	20
- 2-5 papers	6	13
- >5 papers	1	2

*The 'other' category of bachelors level was where the subject of study was reported by one respondent for each subject, including New Zealand Certificate of Engineering (NZCE), product development, commerce, social geography, Bachelor of Science: nutrition, Bachelor of Science (technology): biochemistry, management, and food microbiology.

The response rates from male and female respondents are similar with 52% from males and 48% from females. According to the reported age group, there was quite a wide range of respondents from 20-60 years old¹.

The majority of respondents (74%) reported bachelors level as their highest education compared to secondary level (11%) and postgraduate level (15%). 'Food technology' was most commonly mentioned (24%) for the bachelors level followed by 'food science' (13%) and 'diploma' (9%). More than half of the respondents (65%) reported that they have never participated in nutrition education, while 20% have done 1 paper and 13% have completed 2-5 papers of nutrition education.

5.2.2 Company and work details

The description of the respondents' company and work details includes their positions in the company, the products developed and marketed by the company, the size of the company and the existence of a formal nutrition policy. The summary of these details is shown in table 5.2, 5.3 and 5.4.

Respondents' positions in the company are shown in Table 5.2. The survey was sent to the 'food technologists', which is the most commonly reported position (22%), followed by 'product developers' (18%), 'technical manager' (12%) and 'marketer' (7%). Most respondents who reported their role as 'food technologist' also cited another role, so the number of reported positions was more than the total number of respondents.

The products manufactured and marketed by the companies were divided into three groups, which were general food products, confectionery and food ingredients. These groups are based on the classification in the telephone books under two categories, food manufacturers and confectioners; and from the selection from the book of ingredient suppliers. The distribution of products manufactured and marketed by the company that respondents work for is shown in Table 5.3.

¹ There was no report of age group for respondents who did the questionnaire through the web survey, which was unfortunately due to an error from the web survey design.

Table 5.2: Respondents' positions in the company

Position	Respondents	
	Number	Percentage
Food Technologist	16	22
Product developer	13	18
Technical manager	9	12
Marketer	5	7
Production manager	4	5
Research and development	3	4
General manager	3	4
Quality control	3	4
Technical sales manager	2	3
director	2	3
Product manager	2	3
Owner operator	2	3
Other ²	10	14
Total	73	100

Table 5.3: Products manufactured and marketed by the company that respondents work for

Products	Respondents	
	Number	Percentage
General food products	28	61
Chocolate and confectionary	5	11
Food ingredients	12	26
None ³	1	2
total	46	100

The majority of respondents worked for companies classified as producing general food products (61%), compared to manufacturing food ingredients (26%) and producing confectionery (11%). General food products that were commonly reported were snacks (18% of total reported general food products), fruit and vegetable products (14%) and dessert (14%). Types of food ingredients reported were varied including seasoning, batter, sausage mixes, spice blend, flavours, dairy ingredients, modified starch, and sauce/herb extract.

² The 'other' category included the positions: food and safety manager, lab team leader, technical resource, purchasing manager, customer services, HACCP manager, application technologist-flavour, OSH, sensory technologist and account manager (one of each).

³ One respondent reported no products manufactured in the company which may be because this company gets other companies to manufacture the products for it and the company only markets/sells these products.

Table 5.4: The size of the company that the respondents work for

Number of employees	Number of companies	Percentage
<50	33	72
50-100	5	11
>100	8	17
Total	46	100

The size of companies that respondents work for is shown in table 5.4. The majority of respondents(72%) were from the small companies with less than fifty employees.

Only six companies from the 46 (13%) had a written nutrition policy. Four of these companies had more than 100 employees and two had less than 50 employees. The products developed in the companies that reported having a written nutrition policy were all in the category 'general food products', including margarines, snack foods, fruit and vegetables, corn chips, sport nutrition products and cereal products.

5.2.3 General diet evaluation/advice

Respondents were asked to give advice to university students about how to stay healthy and live a long time. The most commonly mentioned advice was eating more fruits and vegetables (72%), moderation (50%), balanced diet (37%), and also a limitation of fat intake (35%). The advice given was basic advice, which implies that respondents may learn about nutrition from the same sources as the general public.

Respondents were also asked to describe good things about their diet; these responses were similar to the responses for advice to university students, for example, balance, variety, exercise, eat lots of fruits and vegetables, etc. The common responses of good things about their diets were high fruit and vegetable intake (43%), good sources of protein intake (17%) e.g. lean meat and nuts, limitation of fat intake (11%), and having a balanced diet (11%).

Moreover, respondents were asked to report bad aspects of their diets. The answers were noncompliance with some of the advice they offered to university students. The common responses were too much convenience/takeaway foods (20%), eating too much (15%), too much alcohol (11%) and not enough fruits and vegetables (11%).

The low number who mentioned not having enough fruits and vegetables and eating too much, which is similar to the lack of moderation, possibly means that the majority of the respondents thought that they had food in moderation and adequate fruits and vegetables intake.

5.2.4 Sources of nutrition information

Reported sources of information about nutrition include publications, industry information, media and education. The percentage of respondents who reported the following sources of information about nutrition were 59% for publications, e.g. magazines, newspaper and books; 20% for media, e.g. television and the Internet; 15% for industry information, e.g. food industry magazines and work experience; and 13% for education.

These results support the point from the section above (5.2.3) that more than half of the respondents pick up nutrition information from general publications, the same as the general public. Surprisingly formal education and industry publications did not seem to be common sources of information.

5.2.5 Measurement of individual variable including in the model

The data of each variable including score range, results of the reliability test (alpha), total mean scores and standard deviation are shown in Table 5.5.

The coefficient of internal consistency (alpha) ranged from 0.66-0.77, which indicates good internal consistency for each variable (Rosenthal et al, 1984).

5.2.5.1 Nutrition knowledge

The mean score of nutrition knowledge is 13.7 (53%) with a standard deviation of 3.8 (table 5.5). The percentage of respondents who got the answers correct for individual nutrition knowledge question is shown in appendix 5.1. The results show that most respondents knew that saturated fats are usually found in animal products (91%), meat is not a good source of fibre (91%), and antioxidants may provide protection against cancer (96%). On the other hand, a low percentage of respondents knew that a high

intake of protein and sodium increases the risk of osteoporosis (20%), that folate which is added to food is more available to the body than folate naturally present in food (13%), and that cooked carrots provide more available antioxidants than raw carrots (16%). The low percentage of respondents who got the last three questions above correct is because these nutrition questions require more advanced knowledge and understanding than other questions. The respondents would not be able to obtain this nutrition information from general publications, the main source of nutrition information reported by most respondents (section 5.2.4).

Considering the ranking of nutrient content in foods, 48% of respondents got the answers all or mostly correct (3 or 4 out of 4)⁴ for the ranking of fat content of four foods (cola, potatoes, chocolate and roasted peanuts), compared to 26% for the ranking of fibre content of four foods (lamb, white bread, weetbix, and apple) and 9% for the ranking of sodium content of four foods (margarine, bread, cheese, chippies). These results show that less than half of all respondents correctly answered these ranking questions, which may be because these questions are difficult to answer. Respondents may know approximately the nutrient contents of some foods but when they had to rank the comparative nutrient contents in four foods, it may be difficult to correctly rank them. The percentage of respondents who correctly ranked the fat content in foods was higher than other food compositions, which is possibly because there is more coverage of fat reduction in the media compared to suggestion of changes in other food choices.

In summary, most respondents had good knowledge about basic nutrition, e.g. food sources of saturated fat, fibre and antioxidants. However, they lacked knowledge of particular issues, which were comparative food composition and more advanced nutrition facts.

⁴ The method used to score the ranking of nutrients/additive content in foods is that respondents get '1' if they get the right ranking number, and '0' if they get the wrong ranking number. A score of '3' was not likely, but some respondents answered the same ranking number in two foods, which resulted in right ranking number for only three foods.

Table 5.5: Descriptive information of each variable including in the model

Variables	Possible score	Score range	Coefficient of internal consistency (alpha)	Mean Score (%)	Standard deviation	Comments
Nutrition knowledge	26	6-21	0.66	13.7 (53)	3.8	Higher score means greater nutrition knowledge
Nutrition attitudes	100	47-86	0.76	66.0 (66)	9.1	Higher score means more favourable attitudes towards nutrition
Self-efficacy	25	8-25	0.77	19.5 (78)	3.3	Higher score means more confidence of how to improve nutritional quality of products
Subjective norms	30	7-30	0.77	20.8 (69)	5.0	Higher score means more perceived support for development of nutritionally enhanced products
Home practices enhancing nutrition	42	14-34	0.68	23.4 (56)	5.4	Higher score means greater frequency of practices
Work practices of nutrition consideration	54	1-34	- (not enough data)	15.7 (29)	8.7	Higher score means greater frequency of practices

5.2.5.2 Attitudes towards nutrition

Overall the mean score of nutrition attitudes was positive (66.0 (66%); standard deviation 9.1). The majority of respondents believed that what they eat affects their health, most of them disagreed with the statements: 'I can eat and drink anything as

long as I takes lots of exercise' (70%) and 'enjoying the taste of food is the most important thing for me, so I don't worry much about what I should eat for my health' (70%).

Moreover, many respondents had positive attitudes towards the taste of healthy foods, 74% of them agreed that most vegetables taste good and 50% agreed that wholemeal bread tastes better than white bread. However, some respondents believed that fat (43%) and salt (41%) were important in providing the richest mouthfeel and optimal flavour, and that recipe modification is time consuming (30%) (appendix 5.2). The results imply that taste preference and time constraint may be two barriers to the consumption of healthy diets.

Regarding attitudes towards nutrition labels, most respondents thought that it was important to provide customers with nutrition labels (91%), however, nearly half of respondents (43%) thought that understanding nutrition labels was difficult, which may affect the effectiveness of using nutrition labels in making food choices.

The majority of respondents believed that in their role as food professionals, it was important to consider the nutrition aspects of food products (80%), although a lower percentage of respondents believed that as a food professional, it was important to reduce fat (37%) and salt (30%) in food products. The results suggest that while respondents thought about nutritional aspects in their food professional role they did not always see this in terms of specific actions related to reducing fat and sodium content. This may be due to the type of products developed.

5.2.5.3 Confidence in one's own ability to improve the nutritional quality of food products (self-efficacy)

The majority of respondents had high confidence in their own ability to reduce fat (87%) and reduce salt (89%) in foods, although less respondents indicated their confidence to make reduced fat (61%) and reduced salt products (67%) which would be 'acceptable' to consumers. The first two responses are related to the respondents' home cooking and work practices as well, whereas the last two are related specifically to work practices. Some respondents may think that the consumers may not like the 'healthy' products they developed. Thus the conflicting results may be partly due to

the respondents' perception of what consumers want compared to their own personal preferences. Full results are shown in appendix 5.3.

5.2.5.4 The perception of the company's and the consumer's views towards the development/marketing of nutritionally improved products (subjective norms)

Sixty-three (63%) percent of respondents perceived their company to be more concerned with the general nutritional aspects of food products, compared to concern about fat reduction (38%) and salt reduction (38%). These results were similar to the reported nutrition attitudes in their role as food industry professionals towards nutrition related food practices in product development (section 5.2.5.2). This suggests that respondents' nutrition attitude in their role as food industry professionals is related to the perceived company's view towards nutrition consideration.

Contrary results were found for the importance of consumers' view. Only half of respondents (50%) believed that consumers thought about nutrition when buying foods, whereas many of them agreed that consumers thought it was important to have a choice of low fat and low salt products (93% and 72% respectively). This is possibly because of the availability of these kinds of products in the market that made respondents think that consumers had demand for them. However, the reason that half of them did not think that consumers think about nutrition when buying foods is that consumers do not always choose 'healthy' type products which some 'healthy' type products are only niche products in the market. Full results are shown in appendix 5.4.

5.3 Analysis of the proposed model

In this section the outcome variables (home and work practices enhancing nutrition) are described and they are assessed with other variables to test the model.

Multiple regression analysis (SPSS-version11) is used to examine the relationship between variables in the proposed model. The analysis includes bivariate relationships between independent variables based on the proposed model and the analysis for the overall model.

5.3.1 Nutrition related food practices at home

Positive nutrition related food practices that many respondents carry out at home include eating fish or poultry instead of red meat (91%), substitution of baking, boiling, grilling, or steaming for preparation that are traditionally fried or sauteed (89%), having fruit for dessert (85%), using herbs and spices instead of salt (80%), and reading nutrition labels when they go shopping (76%). Full results are shown in appendix 5.5.

Regarding food practices that may have negative effect on health, more than half of respondents reported they rarely or never asked for fish&chips without salt (57%). Eating fish&chips may be perceived as a special occasion for some respondents, so they might not be worried about sodium content when eating them. More than half of respondents also reported often or sometimes frying meat using some oil (70%). Frying foods is a common cooking method that may be difficult to change. This result is supported by the results of National Nutrition Survey (1997) that one-third of adult New Zealand population felt it would be hard to eat less fat foods because high fat foods taste good (Russell et al., 1999).

Sodium reduction seems to be less important issue than fat reduction. More respondents (74%) reported they were likely to choose low fat products than those reported choosing low salt products (46%). Similarly, previous research by Scott and Worsley (1997) found that more New Zealand main shoppers looked at fat content (57%) on nutrition labels than sodium content (27%).

To conclude, respondents follow some positive home practices which improve the nutritional quality in their diet. However, it is not known if some practices are done for nutritional or other reasons, e.g. the choice of poultry or fish could be personal preference. There are particular aspects of nutrition that they may be more concerned with than others, e.g. more concern towards fat reduction than sodium reduction.

Reading nutrition labels is another kind of home practices that may lead to improved nutrition quality in the respondents' diets. The majority of respondents (76%) reported always or sometimes reading nutrition labels when go shopping. However, compared

with attitudes towards nutrition labels, 43% of respondents thought that understanding nutrition labels is difficult while 91% thought that it is important to provide customers with nutrition labels (section 5.2.5.2).

The frequency of reading nutrition labels is significantly positively correlated with the belief that it's important to provide customers with nutrition labels (correlation coefficient (r) of 0.326; $p=0.029$). But there was not a significant correlation between the frequency of reading nutrition labels and the belief that understanding nutrition labels is difficult ($r = 0.145$; $p=0.343$). This means that although understanding nutrition labels is difficult for some people but they believed it is important to read nutrition labels. Respondents may read nutrition labels only for the aspects that they understand or are interested in (Scott and Worsley, 1997).

5.3.2 Nutrition related food practices at work

Overall thirty-five (35) of the respondents reported work practices in which they had considered nutrition. Thirty-five (35) had considered it during product development, twenty-seven (27) reported during product reformulation and twenty-one (21) respondents reported considering nutrition in marketing (table 5.6). The number of respondents who reported nutrition enhancing practices in product reformulation and marketing was lower than those reported practices in product development, which is because some respondents had never reformulated/marketed a product.

Fat reduction was the most commonly reported work practices related to nutrition. Eighty-nine percent (89%) of the respondents reported they had reduced fat in product development sometimes or often. Similarly, 85% reported fat reduction in product reformulation and 71% reported so in marketing (table 5.6). This unsurprising result is probably because fat reduction is the major public interest for diet and health concern, and is also the ingredient NZ consumers are most likely to look for on a food label (Scott and Worsley, 1997).

Table 5.6: Percentage of respondents who had done work practices in each category for each type of consideration

Frequency of nutrition related food practices at work	Percentage of respondents who had done work practices in each category for each type of consideration
<u>Product Development</u> (n=35)	
-Add fibre	54
-Add vitamins or minerals	49
-Reduce fat	89
-Reduce sodium	69
-Alter type of fat	57
-Other	14
<u>Product reformulation</u> (n=27)	
-Add fibre	55
-Add vitamins or minerals	37
-Reduce fat	85
-Reduce sodium	56
-Alter type of fat	52
-Other	7
<u>Marketing</u> (n=21)	
-Add fibre	19
-Add vitamins or minerals	33
-Reduce fat	71
-Reduce sodium	38
-Alter type of fat	24
-Other	14

*Scores of frequency of work practices enhancing nutrition: 0=never, 1=rarely, 2=sometimes, and 3=often.

The next most commonly reported nutrition related work practice was sodium reduction which was reportedly considered sometimes or often by 69% of respondents during product development, 56% during product reformulation and 38% in marketing. The low percentage of respondents who promoted sodium reduction as a marketing benefit may be because sodium reduction is not applicable for some products.

Only a small percentage of respondents reported 'other' category of practices not included in the list. Examples of 'other' practices are increased protein, reduction of sugar, reduction of carbohydrate, reduction of gluten and removal of chemical additives.

The most common reason that respondents reported they had not considered nutrition when developing, reformulating and marketing a product was that it was not stated in brief (41-57%; percentage is a range because of different responses for each role when developing, reformulating and marketing a product). Other reported reasons were that it was not a company policy (20-23%), someone else was doing it (21-37%), and they would like to learn how (5-6%). No one reported that they did not have time to do it.

Surprisingly, knowledge of how to develop/market nutritionally improved products, time and cost (i.e. barriers) did not seem to be the reason that nutrition related work practices were not done.

5.3.3 Bivariate relationships between independent variables

Regression analysis was used to examine the relationship between pairs of independent variables as shown in the model. The results are shown in table 5.7.

Table 5.7: Bivariate relationships between independent variables

Variables (Independent vs dependent variable)	Standardized Coefficients : Beta	t	P-value
Nutrition education vs Self-efficacy	0.35	2.50	0.016*
Nutrition education vs Knowledge	0.15	0.98	0.333
Self-efficacy vs Knowledge	0.19	1.27	0.210
Knowledge vs Attitude	0.08	0.54	0.592

* The relationship is statistically significant at $p \leq 0.10$

A statistically significant relationship was found between nutrition education and confidence of one's own ability to altering a product to enhance nutritional value. However, the relationships between other pairs of independent variables were not found, which is possibly because the measurement tools for these variables were not properly designed to measure the expected outcome variables (Rosenthal et al, 1984). For example, the measurement of nutrition knowledge included the knowledge of more advanced nutrition facts, which may not be relevant to respondents' nutrition attitudes related to more basic nutrition issues.

5.3.4 Prediction of home and work practices related to improving nutrition using the model

The proposed model was assessed using regression analysis for the full model. This analysis is referred to as the “full model”. The results are shown in table 5.8.

Table 5.8: Assessment of “full model”

Dependent variables	Independent variables	R ²	Standardized Coefficients: Beta	t	P-value
Home practices enhancing nutrition	Knowledge	0.28	-0.11	-0.81	0.420
	Attitude		0.51	3.13	0.003*
	Self-efficacy		0.11	0.75	0.458
	Subjective Norm		-0.12	-0.79	0.433
work practices intentionally altering nutrition	Knowledge	0.29	0.28	1.79	0.084*
	Attitude		-0.07	-0.37	0.717
	Self-efficacy		0.40	2.37	0.024*
	Subjective Norm		0.16	0.88	0.384

* The relationship is statistically significant at $p \leq 0.10$

Attitude towards nutrition was positively related to overall nutrition related food practices at home but it was not related to work practices. Instead, nutrition knowledge and confidence of one's own ability to improve nutritional aspects in foods were positively related to overall nutrition related food practices at work. The expected relationship between subjective norms and work practices considering nutrition was not found, possibly because there were some important factors missing in the model, such as the type of product. That some important factors are missing is suggested by the low R² value for the model (Hair et al, 1989).

Because subjective norms include the perception of company's and consumer's thoughts about nutrition issues, the analysis between variables was done again with subjective norms divided into consumer norms and company norms in order to examine possibly different relationships of these two groups of subjective norms with other variables in the models. The results are shown in table 5.9.

The results show that when subjective norms were divided into company norms and consumer norms, R² was improved from 0.29 to 0.36 for the model of work practices enhancing nutrition but it was not improved (R² = 0.28) for the model of home practices enhancing nutrition.

Table 5.9: Assessment of the 'full' model with subjective norms divided into consumer and company norms

Dependent variables	Independent variables	R ²	Standardized Coefficients: Beta	t	P-value
Home practices enhancing nutrition	Knowledge	0.27	-0.11	-0.75	0.457
	Attitude		0.45	2.38	0.023*
	Self-efficacy		0.15	0.88	0.384
	Company norms		-0.03	-0.18	0.856
	Consumer norms		-0.00	-0.03	0.980
work practices intentionally altering nutrition	Knowledge	0.36	0.23	1.41	0.169
	Attitude		-0.11	-0.54	0.594
	Self-efficacy		0.29	1.56	0.130
	Company norms		0.36	1.93	0.064*
	Consumer norms		0.08	0.35	0.732

* The relationship is statistically significant at $p \leq 0.10$

When analyzing the model using the overall subjective norms, nutrition knowledge and confidence of one's own ability to improve nutritional aspects in foods were significantly related to work practices enhancing nutrition (table 5.8). However, when using the divided subjective norms, only the perception of the company's view in nutrition consideration was positively related to work practices enhancing nutrition. This may be because some of the respondents with a high perception of consumer concern towards nutrition might not be involved with products for which nutrition was generally considered important; therefore the subjective norms (company) and actual practices were low.

In addition, there is a positive correlation of subjective norms (company) with nutrition knowledge ($r = 0.29$; $p = 0.061$) and self-efficacy ($r = 0.28$; $p = 0.073$), which helps to explain why nutrition knowledge and self-efficacy were significant in the model containing the overall subjective norms. Thus, there is the possibility of reverse causality that company policy can lead to work practices enhancing nutrition which may in turn increase nutrition knowledge and self-efficacy.

The reason that only subjective norms (company) but not subjective norm (consumers) were related to work practices may be explained by a closer look at those who report seldom or never considering nutrition in actual practice at work (table 5.10). Twelve (12) respondents reported never or seldom intentionally enhancing nutritional quality of their products. It is shown that for some of these respondents the

score for subjective norms (consumers) was high but the respondents did not report any work practices enhancing nutrition. This may be explained by the type of food products for which the respondents were responsible.

General food products developed or marketed by the companies of respondents who reported never or seldom considering nutrition at work include pasta, sauce, potato chips (fish&chips), fruit&vegetables wholesales, cookies, beverages and sausages. Most of these products are not usually developed or marketed as nutritionally enhanced products. Of particular interest are the 5 who work for companies manufacturing 'confectionary'. Their score for the subjective norms (consumers) (mean score =11) is higher than that for subjective norms (company) (mean score =7), and is in contrast to similar mean scores between subjective norms (consumers) (11.37) and subjective norms (company) (10.31) for the entire sample.

Table 5.10: Subjective norms of respondents who reported seldom or never considering nutrition in product development or marketing

product	Mean score (possible score=15)	
	Subjective norms (company)	Subjective norms (consumer)
General food products (n=7)	10.1	10.7
Confectionery (n=5)	7.2	11.0

Note: Mean scores of subjective norms (company) and subjective norms (consumers) for the entire sample were 10.31 and 11.37, respectively.

5.4 Analysis of partial models: fat and sodium

The overall model was divided into partial models of the specific aspects of nutrition of fat and sodium. This was done because respondents may have particular interests in some areas of nutrition and this may lead to different relationships compared to the full model. For example, Scott and Worsley (1997) found that 57% of New Zealand shoppers looked for fat content on the label, as compared to 27% who looked for sodium content.

Descriptive details for scores of knowledge, attitudes, etc. related to fat and sodium reduction are shown in table 5.11.

Table 5.11 : Descriptive details of variables in partial models: fat and sodium

Variables	Possible score	Mean score (%)	Score range	Standard deviation
<u>Fat</u>				
Knowledge	8	5.7 (71)	2-8	2.0
Attitude	30	18.4 (61)	8-25	3.9
Self-efficacy	10	7.9 (79)	4-10	1.4
Subjective norms:company	5	3.3 (66)	1-5	1.0
Subjective norm:consumer	5	4.2 (84)	3-5	0.6
Home practices enhancing nutrition	27	14.9 (55)	8-23	3.8
Work practices enhancing nutrition	9	4.6 (51)	0-9	2.3
<u>Sodium</u>				
Knowledge	5	0.8 (17)	0-4	1.1
Attitude	10	5.7 (57)	1-9	2.0
Self-efficacy	10	7.8 (78)	3-10	1.5
Subjective norms:company	5	3.3 (66)	1-5	1.0
Subjective norm:consumer	5	3.8 (75)	2-5	0.8
Home practices enhancing nutrition	9	4.0 (44)	0-8	1.8
Work practices enhancing nutrition	9	3.4 (38)	0-7	2.0

The means scores for knowledge, attitudes and other variables related to fat and sodium reduction are different from the scores of the overall model suggesting that respondents had different beliefs/views for different aspects of nutrition. For example, the percentage of mean score for nutrition knowledge related to fat reduction (71%) was higher than overall knowledge score (53%) while attitudes fat reduction score (61%) was lower than overall attitude score (66%). Both knowledge (17%) and attitude scores (57%) related to sodium reduction are lower than overall scores.

For these partial models the outcome variables, nutrition knowledge, attitude, self-efficacy and subjective norms all referred to only one aspect of nutrition. The results are shown for home practices (table 5.12) and work practices (table 5.13).

When dividing the model into fat and sodium, the results of partial model analysis were different from the full model. Regarding findings related to home practices (table 5.12), the R-square was very small (0.14) and there were none of the independent variables were statistically significant at $p=0.1$. This is possibly because the respondents who replied to the survey had different views related to fat reduction.

For example, some respondents reported favourable attitudes related to fat reduction but their home fat reduction practice scores were low, which implies that they may have their own way of reducing fat in their diet which were not specified in the home practices questions or they may find it difficult to reduce fat because of their preference with high fat foods. This may lead to a lack of relationship between attitudes and home practices regarding fat reduction.

Table 5.12: Partial models : home fat and sodium reduction practices

Dependent variable: Home practices considering nutrition	Independent variables	R ²	Standardized Coefficients : Beta	t-value	P-value
<u>Fat reduction</u>	Knowledge	0.14	0.03	0.17	0.867
	Attitude		0.31	1.52	0.136
	Self-efficacy		0.18	0.93	0.360
	Company norms		-0.18	-1.02	0.317
	Consumer norms		-0.06	-0.34	0.738
<u>Sodium reduction</u>	Knowledge	0.22	-0.10	-0.59	0.561
	Attitude		0.24	1.32	0.196
	Self-efficacy		-0.03	-0.16	0.871
	Company norms		0.10	0.62	0.541
	Consumer norms		0.29	1.74	0.091*

* The relationship is statistically significant at $p \leq 0.10$

The partial model of home practices related to sodium reduction shows an R-square similar to the full model, but interestingly attitude regarding sodium reduction is not significantly related to home sodium reduction practices. Instead, the perception of consumers' views in the consideration of sodium reduction in food products was positively related to home practices considering sodium reduction. This suggests that home practices considering sodium reduction may lead to the perception that consumers are concerned about sodium reduction or vice versa.

The partial model of work practices is more predictive of fat reduction than the full model, but the partial model of sodium reduction has lower R-square. The unexpected result was found for the negative relationship between nutrition attitudes and work practices regarding fat reduction (table 5.13). The negative finding may be because respondents had tried to improve nutritional quality in their products (so report positive practices at work) but the low sales of these types of products lead to negative attitudes towards fat reduction at work.

Table 5.13: Partial models: nutrition enhancing practices at work related to fat and sodium reduction

Dependent variable: work practices considering nutrition	Independent variables	R ²	Standardized Coefficients : Beta	t-value	P-value
<u>Fat reduction</u>	Knowledge	0.42	0.20	1.27	0.213
	Attitude		-0.48	-2.30	0.029*
	Self-efficacy		0.25	1.18	0.249
	Company norms		0.38	2.06	0.050*
	Consumer norms		0.22	1.11	0.278
<u>Sodium reduction</u>	Knowledge	0.19	-0.11	-0.51	0.612
	Attitude		-0.36	-1.61	0.121
	Self-efficacy		0.21	0.89	0.382
	Company norms		0.14	0.65	0.525
	Consumer norms		0.28	1.29	0.210

* The relationship is statistically significant at $p \leq 0.10$

This finding may also be explained by the types of products that respondents developed or marketed. Some respondents had positive nutrition attitudes regarding fat reduction (mean scores > 50%) but they had not decreased the fat or marketed the product based on low fat because types of their products were not conducive to nutritional enhancement (e.g. confectionery).

As in the full model there was a positive relationship between the perception of the company's view in consideration of fat reduction and actual work practices regarding fat reduction.

None of the independent variables were found to be significant in the partial model for sodium reduction. The low R² (0.19) for this model suggest that some important factors were missing in the model.

No significant correlations were found between home and work practices overall or between home and work practices regarding fat reduction. However, a positive correlation was found between home practices and work practices regarding sodium reduction ($r = 0.29$; $p = 0.083$). There was no reported concern about sodium reduction from the open ended questions on diet evaluation/advice, so it is predicted that respondents have a low concern about sodium reduction and therefore would not have an effect on work practices regarding sodium reduction. Therefore, this

correlation is likely to indicate reverse causality; i.e. work practices have lead to home practices rather than the other way around.

5.5 The relationship of company factors with nutrition related food practices at work

The analysis of the relationship of company factors, including the existence of a written nutrition policy and the size of the company, with nutrition related food practices at work was done using the general linear model approach (SPSS-version11). As expected, the results showed that the existence of written nutrition policy is positively related to work practices enhancing nutrition ($P=0.002$). However, the size of the company was not related to nutrition related work practices, which implies that size of the company is not a factor for the frequency of work practices enhancing nutrition. Results of general linear model analysis are shown in appendix 5.7.

5.6 The relationship of demographic factors with variables in the proposed model

The relationship of demographic factors with variables in the proposed model was also examined using the general linear model approach. No relationship was found between the demographic factors and other variables in the model which may be due to the small sample used in this study.

5.7 Comparison between web based and paper based survey

Of the 46 responses from the survey, 15 completed the web based survey (15% of total 99 surveys sent as web survey) whereas 31 of them completed paper based survey (31% of total 100 surveys sent as paper survey). The higher response rate from the paper based survey is possibly because it was physically present and ready to fill in. In order to respond to the web survey the respondents needed to access a computer, connect to the internet and type the web address before they could see the questionnaire.

Comparison of response rates between gender finds that 65% (n=20) of those who did the paper based survey were males while 73% (n=11) of those who did the web based survey were females. This result may indicate that males and females have different roles within the job description of food technologist.

Unfortunately there was no report of age group for respondents who did the questionnaire through the web survey, this was due to an error in the web survey design. Comparison of response rate related to age cannot be carried out.

Considering the item nonresponse rate, the response to two open ended questions was higher for the web survey than for the paper based survey. There was a 26%(n=8) and 0%(n=0) item nonresponse rate for the fifth piece of advice given to university students was found in the data of paper based and web based survey, respectively. This may be because it was easier to type in the long answers via web based survey than write in the answers via the paper based survey. The other difference in item non response rate was found in the work practices enhancing nutrition questions. 48% (n=15) item non response rate was found in the data of paper based survey with 27% (n=4) found in the data of web based survey. However, this difference in item non response rate is likely to be because some respondents had never done any work practices enhancing nutrition so they left the answers blank.

Another issue was the unusable responses in the ranking of nutrients content in nutrition knowledge questions. Three respondents from the paper based survey repeated the ranking number for some foods given or did not put in any ranking number compared to two respondents for the web based survey. This is not likely to be related to the use of web based and paper based survey but could be because the ranking questions were quite difficult to answers and the respondents were not sure about the answers of these questions so they judged some foods as equal.

In summary, respondents may still prefer to respond via the paper based survey rather than the web based survey as indicated by the higher response rate in the paper based survey. However, for the open ended questions, respondents may be more willing to put in their answers via web based survey than paper based survey because it might be easier to type in the answers via web based survey.

5.8 Discussion

This section includes a discussion of aspects of response rate, the respondents and the measurement tools. Also, the survey findings are discussed including the areas that can be followed up in the in-depth interview.

5.8.1 Responses and measurement

The response rate was low (23%), which may be because the time that the survey was sent was the start of a busy time of the year in New Zealand (November, 2001), so perhaps respondents did not have time to reply to the survey.

Moreover, the respondents who replied to the survey might be the ones who had a particular interest in nutrition more than average while those who were not interested in nutrition issues might not bother to do the survey. This may lead to response bias as respondents who did the survey may not have the same views as general food industry professionals.

The measurement tools used to examine variables in this study were not tested for the validity. Measurement tools that lack of validity may lead to the missing relationships, this is suggested by the low R^2 value of the regression analysis for the model. The survey was only tested for the reliability of the test construction, which was found to be reasonable (coefficient of internal consistency (α) = 0.66-0.77).

5.8.2 Main findings and areas to be asked in the interview

Of the 46 respondents who replied to the survey, 35 of them reported work practices related to nutrition, which suggests that nutrition related food practices in the work environment is common. The perception of the company's views towards the development or marketing of nutritionally improved products was the only factor positively related to work practices enhancing nutrition. In relation to home food practices, nutrition attitude was related to enhancing nutrition.

The minority of the respondents (13%; $n=6$) reported a formal nutrition policy in the companies they worked for. However, many respondents who reported no nutrition policy also commonly carried out practices at work in which nutrition was considered.

In addition, a high percentage of respondents (63%) perceived their company to be concerned about nutrition although there was no formal nutrition policy. An area to be clarified in the interview was that how the message of nutrition consideration was sent to food industry professionals in the absence of a formal nutrition policy, and where the message came from.

Another finding was that while there was a positive relationship between nutrition attitudes and home practices, nutrition attitudes were not positively related to work practices considering nutrition. The question was whether respondents have ever tried to apply their nutrition attitudes at work and what the result was.

Moreover, the lack of relationship between the perception of the consumers' concerns about nutrition (subjective norms consumers) and work practices needed to be investigated further. This might be related to the types of products that respondents developed/marketed.

When respondents reported their frequency of carrying out practices at work in which nutrition was considered, they did not report the details of their practices, e.g. the amount which fat was reduced, the problems that might occur during these practices, how they solved the problems and whether the original product was retained on the market. These areas will be covered in the interview.

Another finding from the survey was that when the model was split into different aspects of nutrition, i.e. fat and sodium, the relationships were different from the overall model. The reason for different findings may be because the respondents had particular views for different aspects of nutrition. The analysis of the partial model of fat reduction showed a positive relationship between subjective norms (company) and work practices regarding fat reduction (which is the same result as the overall model) as well as a negative relationship between nutrition attitudes and work practices regarding fat reduction. The latter finding may be because the nutrition attitudes became negative after the unsuccessful sales of nutritionally enhanced products. The respondents' experience of success of these products will be explored in the interview.

Another finding was the positive correlation between home and work practices regarding sodium reduction. This finding raises the question if the direction of the relationship may be reverse, in other words that work practices influence home practices regarding sodium reduction rather than the other way around. Therefore the question was whether work practices considering nutrition had any effect on the respondents' nutrition knowledge or attitudes.

In summary, the quantitative survey was used to examine the relationships between variables of the model regarding consideration of nutrition in home and work practices. The model did not account for much of the variance in responses, which suggests some important factors are missing in the model, e.g. the type of products. The findings from the survey lead to the design of the interview questions for clarifying the survey results.

6. Interview: Results and discussion

6.1 Introduction

The interviews were carried out to clarify the findings from the questionnaire survey. Examples of the interview transcripts are shown in appendix 6.1.

6.2 Interview results

Of the twelve respondents interviewed, 7 were male and 5 were female. Products developed/marketed by the companies they worked for were sport nutrition supplements, fat & oil spread, pasta, chocolate & confectionery, deli meats, cookies, food ingredients (batter, crumbs, sauces), butter and fruits & vegetables. Of the 6 respondents who reported the formal nutrition policy in the questionnaire, 3 were among those who volunteered to be interviewed.¹

The areas discussed in this section include the respondents' personal nutrition concerns, the message of nutrition consideration, the effect of nutrition attitudes on work practices, details of nutrition related work practices, the experience of success of nutrition enhanced products and the effect of work practices enhancing nutrition on nutrition attitudes.

6.2.1 Personal concerns about nutrition

In the interview the respondents were asked about their nutrition concerns and personal practices concerning healthy foods. The information shared was more in depth than information obtained from the questionnaire survey. Nutrition concerns reported were a balanced diet, fat reduction, variety diet, five fruit & vegetables a day and being aware of what they purchased. Some respondents reported the reasons of their nutrition concerns were health problems (i.e. being overweight and high cholesterol).

¹ At the time of the interview 5 respondents reported a company nutrition policy. This may be because there was not a policy at the time of the survey, but a policy was set up later.

All respondents interviewed read nutrition labels when they go shopping. Some of them mentioned that being food industry professionals made them interested in reading nutrition labels. The nutrients/food composition they looked for on nutrition labels were fat, carbohydrate, protein, sugar, salt, energy, preservatives and additives. Only one respondent mentioned looking at salt content in foods, which supports the survey finding that respondents were not concerned much about salt intake.

6.2.2 The message of nutrition consideration

Five respondents worked in a company that had a formal nutrition policy, so the message of nutrition consideration came from the nutrition policy. Seven respondents worked in companies that had no nutrition policy, four of these believed nutrition was important whereas three thought that nutrition was not important for the company. The beliefs that nutrition was or was not important were not always related to actual work practices enhancing nutrition. Three respondents who worked at the company with no nutrition policy reported practices enhancing nutrition at work, two of these thought that nutrition was important, while one of them thought that nutrition was not important. In addition, the other two respondents who thought nutrition is important did not report any work practices enhancing nutrition.

The source of the message to consider nutrition in work practices for the companies that had no formal nutrition policy was from the director/owner of the company. One respondent who was the owner of the company believed that nutrition was important and had always considered nutrition in product development. Another respondent developed sport nutrition supplements and believed that nutrition was important, while the other developed deli meats and believed that nutrition was not important. The latter respondent was also the owner of the company and had tried to develop and market nutritionally enhanced products but the low sales of these products made him report negative attitudes towards nutrition. This may help to explain why the survey finding shows a negative relationship between nutrition attitudes and work practices enhancing nutrition.

Two of four respondents who had not done any work practices enhancing nutrition thought that nutrition was important. One of them worked in an organic company and had personal belief that organic products had associated nutritional benefits but the company did not try to make nutritionally enhanced products, just tried to make good tasting products with natural ingredients. The other respondent had personal interest in nutrition and encouraged the confectionary company she worked for to set up a nutrition policy in the future, but at the time of interview the main driver in product development was novelty. The other two respondents reported that nutrition was not important because the types of their products were not conducive to nutritional enhancement. The products they developed were chocolates and food ingredients (batter, crumb). This indicates the effect of product types on nutrition consideration.

These four respondents were asked whether they would apply practices considering nutrition if they had a chance. The one of them who developed chocolate reported an interest in reducing saturated fat, sugar, artificial colours and flavourings. The other three respondents did not show any interest to improve nutritional quality of their products because of the types of products (chocolate, food ingredients and organic beverage). One respondent's view was, "The company has been around for more than 100 years. It's more market force. We have reputation ... I think unless we give them some very good reason we stick to making chocolate the traditional way... To actually improve nutrition quality, we'd no longer be selling chocolate and I don't think it would be very well with our brand and our image in the market place." This view suggests that the perception of company's view that nutrition is not important influences work practice.

6.2.3 Effect of nutrition attitudes on work practices considering nutrition

Two respondents reported that their personal attitude about nutrition affected their work practices considering nutrition. One of them was the owner of a cookie company and the other was a student in nutrition working at sport nutrition supplement company. Both of them mentioned high interest in nutrition because they had done lots of reading about nutrition. The reasons that these two respondents can use their personal nutrition attitudes

at work are that one of them has power to do it (the owner of the company) and the other worked with the 'healthy' type products so it was easy to consider nutrition at work.

Other respondents who reported no effect of their nutrition attitudes on work practices gave as their reasons that the types of products were not conducive to nutritional enhancement, that they just followed the nutrition policy or that nutrition consideration was depended on consumers. One respondent said that she had some input in product development but it was not necessarily nutritional aspect; normally she just followed what the consumers want.

Another reason why respondents had never applied their nutrition attitudes to work practices may be because they had positive attitudes towards their own products. Six respondents believed that the products that they altered to enhance nutritional value were really 'healthy'. An example of a respondent' view towards his own products was, "Our main product, pasta, is very healthy- we use very good standard flour, the pasta is very low in fat and high in carbohydrate." Moreover, nine out of ten² respondents reported that they had consumed or bought their own products. Three of them reported choosing 'healthy' versions of the products (margarine and sport nutrition supplements), but two of them bought standard products because they developed only standard products (chocolate and organic beverage). The other four did not indicate if they bought standard or 'healthy' products. Only one respondent, from a confectionery company, did not buy her own products because of personal dislike and the intention not to encourage her own children to eat sweets. This finding indicates that respondents were satisfied with their products. They may not be concerned about nutrition in their products because they may perceive their products as already 'healthy' or in good quality.

² The other two respondents developed products for other food manufacturers, so they did not have their own products in the market.

6.2.4 Details of work practices considering nutrition

Aspects of nutrition consideration at work that respondents reported include fat reduction, fat alteration, sodium reduction, increase carbohydrate and addition of vitamins and minerals.

This section is the discussion of factors influencing nutrition consideration, the degree of changes of nutrition quality in products and problems occurred in the development or marketing of nutritionally enhanced products.

6.2.4.1 Factors influencing nutrition consideration

The main drivers for product development mentioned by the respondents were market (trying to be competitive with others in the market) and consumers, although one respondent who developed pasta said that the main drivers were hygiene and high quality. No one mentioned nutrition, but when asked if nutrition fits into the main drivers, seven respondents agreed that it fit to some extent. These results imply that nutrition fits into the main drivers because of its relevance to market or consumers.

One respondent's view about the marketing influence was "we make changes to our products to try to improve the nutritional aspect...with fat & oil. We are using nutritional components as a focus to develop in the market place by putting product out there with high omega levels, reduce salt and reduce fat in margarine. We look at ways to improve nutritional quality and try to achieve the Pick the Tick Program". Another respondent reported his view towards consumers/market driven products as "It's basically marketing driven, which is marketing in terms of wanting the Heart Foundation Tick; it's consumer driven by the fact that they actually like and choose the salt reduced versions to the others and makes us move towards slightly lower salt level". This finding shows the perception that the company's nutrition consideration is because of market influence.

Another potentially influential factor on work practices considering nutrition was the new labeling regulation that required every packaged food to present nutrition information.

The finding was that only one out of ten³ respondents thought that the new labeling regulations had benefits for their company because people can look at the nutrients on the package, compare information with other products and see that their products are very healthy. Other respondents noted that they only had to change the labels and they did not think the new labeling would have any effect on their consumers i.e. there was no incentive to change the formulation. This was because they did not think that consumers look at nutrition labels when buying foods but they believed the perceived product quality and product's cost usually guided the purchase. Ten respondents mentioned that they did not think many consumers understood or were interested in nutrition information on the food packages. Therefore the new labeling regulation did not seem to have an effect on practices enhancing nutrition, which may be due to the belief that consumers did not look at nutrition aspects when buying foods.

6.2.4.2 The amount of changes for nutritionally enhanced products

Of the eight respondents who reported work practices considering nutrition three respondents reported that product development was moving towards making small changes in all products. They noted that most of their products (pasta and margarine) were low in fat or salt but they also developed traditional recipes that consumers know and like. Another three respondents developed a range of 'healthy' and standard products (cookies, deli meats and butter), which they noted that they did in response to consumers demand. The other two respondents did not report the amount of changes for nutritionally enhanced products⁴.

³ Two respondents developed products for other food manufacturers and they did not make labeling for their products so this question was not relevant for them.

⁴ One respondent did not know about the details of nutritionally enhanced products because she did not work at product development at the time of the interview. Another respondent reported all products were fortified with vitamin and minerals (sport nutrition supplements), so all of them were 'healthy' type products.

This finding implies that some types of products may be more easily acceptable with their 'healthy' version than the others. Therefore, the amount of changes in nutritionally enhanced products is depended on the consumers' demand or the types of products.

6.2.4.3 Problems occurred during the developing/marketing nutritionally enhanced products

One of the problems occurring during developing or marketing of nutritionally enhanced products was the cost of these products. One respondent had tried to make high protein, low carbohydrate cookies by using high protein flour, adding nuts and eliminating condensed milk. The development was successful but he noted that the development needed to balance between cost and quality. For example he had to consider using peanuts instead of almonds because they were different in price. This respondent reported that, "unfortunate is the sheer cost, while I have a product that fits my perspective, the price of that product would be high and I wouldn't sell too many of them".

Another respondent also had a similar view. He was the owner of a deli meat company and had tried to alter a product to enhance nutritional value but had not been very successful. His view was "It's been a big disappointment to us that it appears that every survey that you go to you ask consumers and they tell you how important nutrition is but their behaviour is completely contrary to it... Good food costs money and consumers generally are reluctant to pay. They might impress everybody once a week. During their normal weekly shopping and their normal week eating they eat rubbish because it's cheap."

Another problem was the consumer's preference for standard products. One respondent reported that one of his products, 'wholemeal' chocolate chip cookies were not accepted to the consumers because of the word 'wholemeal'. He said "at the end of the day, you still got to give consumer what they want despite your personal feelings... Despite what people say, in the end of the day, they eat what's nice-- in particular the younger age group which is one of our target markets. They'll eat what they want". Three more respondents also had similar views that consumers did not always want the 'healthy'

products. Two respondents reported that they had to gradually change the formula over a period of time in order to gain consumers' acceptance in their products (cookies and margarine).

Another issue was technical problems that occurred during the development of nutritionally enhanced products. Three respondents reported that there were hard technical issues when they did practices considering nutrition at work (fat reduction in margarine, increased protein and decreased carbohydrate content in cookies). They mentioned that they got information from other sources, e.g. ingredient suppliers, research division and publications. One respondent said "You can reduce fat level from 82% to 60% without too many problems, the biggest concern is the emulsion, if the emulsion breaks down then the problem is microbiological damage. When trying to go down below 60%, you have to have the correct equipment to make it a stable enough emulsion and add a lot of stabilisers and working out the blend required." This result shows that knowledge of where to get information about technical issues and willing to try something new is important for successfully altering a product to enhance nutritional value.

These findings suggest that respondents had to face many problems during the developing/marketing nutritionally enhanced products. They had to balance between quality, cost and consumers' acceptance and had to consider technical knowledge in developing nutritionally enhanced products.

6.2.5 Effect of nutrition related work practices on nutrition attitudes

Two respondents reported that their personal attitudes about nutrition had changed after they had carried out practices at work improving nutritional quality. They mentioned the effect of nutrition practices on personal views about the positive benefits of fat for proper body function and as a tool for weight control. One respondent mentioned that after he had done a lot of readings about nutrition he came to believe that a diet low in carbohydrates and high in protein and fat was 'healthy', so he used his personal perspective to develop high protein, low carbohydrate cookies and also adopted this

perspective to change his own diet.. The other respondent mentioned that after he had worked with the development of nutritionally enhanced margarine, he understood the benefits of some types of oil and he started to use them, e.g. olive oil or margarine.

Three other respondents noted that their personal attitude about nutrition have not changed after they have applied nutrition practices at work because they were aware of nutrition initially.

These findings show that the effect of work practices considering nutrition on respondents' nutrition attitudes was not common for the respondents interviewed which is possibly because they already had their own views about nutrition issues.

6.3 Discussion

The number of respondents interviewed was small (n=12) and they were not representative of the questionnaire survey sample. However, the information gained from the interview provided insight into nutrition related issues of the respondents' personal nutrition concerns and into their work experiences related to nutrition.

Respondents were interested in nutrition which was suggested by their reported nutrition concerns and the reading of nutrition labels. On the contrary, most of them believed that consumers did not look at nutrition labels when buying foods. This finding was similar to the finding from the questionnaire that half of respondents (50%) did not think that consumers considered nutrition when buying foods. This belief may explain why there was no anticipated effect of the new labeling regulations.

The message of nutrition consideration came from the nutrition policy or from the owner/director of the company. More information was obtained from the interview about the source of the companies' nutrition considerations; that they come from the market influence and the consumers' demand.

Most respondents reported no effect of personal attitudes on work practices but they usually developed what consumers want. Moreover, the belief that their products were actually 'healthy' may decrease respondents' personal concern about nutrition in their products. Similarly, the effect of work practices on respondents' nutrition attitudes was not commonly reported, which is possibly because they already had their own interest in particular nutrition issues.

Respondents developed a range of products, including standard and 'healthy' products because of the difference in consumers' needs, preferences and financial constraints. However, some of them reported that most of their products were altered to enhance nutrition value, which may be because the types of products they developed were easily acceptable for 'healthy' version, i.e. pasta and margarine. The finding also suggest that technical knowledge in developing nutritionally enhanced products was important which support the questionnaire finding for the positive relationship between the confidence of one's own knowledge of how to improve nutritional quality in foods and work practices enhancing nutrition. However, the respondents reported no problems of how/where to get technical information. The interview findings also confirm the effect of types of products on nutrition consideration found in the questionnaire survey. Some types of products, e.g. chocolate were not usually altered to enhanced nutritional value. This may be because it was company image to produce the products the traditional way or there was no consumer's demand for 'healthy' type of these products.

In summary, the interview explored more in depth the information obtained from the self-administered questionnaire. The interview findings emphasise the company's influence on work practices considering nutrition from the market trend or consumers' demand. Also, the type of products was an important factor in determining whether the products should be altered to enhance nutritional value. Moreover, nutrition attitudes were not commonly applied in work practice, which may be due to the positive attitudes towards the respondents' own products and the belief that consumers did not consider nutritional aspects when buying foods.

7. Overall discussion and conclusion

7.1 Introduction

This chapter is a discussion of overall findings from the study. This study has provided a preliminary look at some issues surrounding the nutritional improvement of food products. The implications from the study can be used to examine possible ways to increase 'healthier' food supply. The details of the discussion include the main findings, the comparison of paper based and web based survey, survey limitations, suggestion for future research and overall conclusion.

7.2 Main findings

Work practices that enhance nutrition were common for more than two thirds (76%) of food industry professionals surveyed (see section 5.8.2). The most common types of work practices to enhance nutrition were fat and sodium reduction. These practices were done mainly because of the perception that the company placed an importance on nutrition, not because personal interest about nutrition.

Personal attitudes of food industry professionals appeared to have little or no effect on nutrition consideration at work except in cases where that person owned the company. This is possibly because there are many important factors to consider in the product development process and nutrition is not generally a major factor. Thus there seems to be no benefit of increasing nutrition education of food technologists, except perhaps if there is an effect as they move up through company management.

The model could not explain the consideration of nutrition as part of work practice, because personal discretion did not seem to be important and key variables related to company policy and product brief were not included in the model. Although nutrition knowledge and confidence of one's own ability to improve nutritional quality in food products were associated with nutrition practice at work in the initial analysis, further analysis found that this was mediated through the respondent's perception of the company's views towards the improvement of nutritional quality in food products. These findings suggest that the model should be changed so that nutrition knowledge and self-efficacy are indirectly related to work practices through their correlations with subjective norms (company). In addition, nutrition attitudes could be removed from the model or attitudes more specifically related to work practices enhancing nutrition could be assessed.

The model related to home practices was confirmed only for the relationship between nutrition attitudes and home practices enhancing nutrition. Other variables were not found to be significant in the proposed model, which may be because the measurement tools were lacking validity. For example the nutrition knowledge measure included ranking questions that may be too difficult to answer, so they could not measure the respondents' actual nutrition knowledge related to their 'healthful' food practices. On the other hand, it may be that for the practices which were asked about nutrition knowledge was not a major factor, for example the respondents may choose to flavour foods with herbs and spices instead of salt because of their interest in food and flavours, not because of concern about health. Moreover, subjective norms constructs were designed to be related to work practices only, so they should be changed to be more related to respondents' home practices if the model is to be used in this way, e.g. the perception of the family member's views about nutrition in home cooking.

The models of nutrition related practices at home and work are different because of the influence of the company on work practices. Respondents have more freedom to use their person views about nutrition in their home cooking and at home some of the competing motivations/objectives that are present at work are not factors, for example at home they do not need to worry about production details, marketing, etc. Possibly the respondents are so busy at work with all the other requirements of the product brief that nutrition does not feature and perhaps it has not occurred to them.

The interviews were useful in exploring in depth the information obtained from the questionnaire. The interview helped to confirm the questionnaire findings that the main influence on nutrition related work practices is the company's view towards nutrition. This was the case whether or not the company had an official 'nutrition policy'. The company's views were usually reported to come from market research and consumers.

The discussion of the usefulness of each variable in the models including the impact of type of product is discussed below.

7.2.1 Nutrition knowledge

Nutrition knowledge was indirectly related to work practices through its correlation with the perception of the company's view towards nutrition, although it is not known if this is a causal relationship. It is plausible that a perception that the company considers the nutritional quality of food products to be important lead the respondents to search for more knowledge about nutrition, thus increasing their nutrition knowledge.

7.2.2 Nutrition attitudes

An increasingly positive attitude towards nutrition was positively related to the frequency of home practices enhancing nutrition but it was not related to work practices. This is in contrast to previous research of US chefs' attitudes towards nutrition (Reichler and Dalton, 1998); their attitudes were positively related to their 'healthful' food preparation practices at work. This is possibly because chefs had more opportunity to apply their personal nutrition attitudes at work. Also chefs may feel more personal relationship with their customers, i.e. they cook the food and it is served directly to their customers. Moreover, there is less influence on chefs from other people at work, e.g. the food technologists have to consider the views of production manager, marketer, etc. when making a decision about the product formulation.

The lack of the relationship between nutrition attitudes and the development/marketing of nutritional modified products is possibly because there were no motives to do it and they just followed what the company wanted. There was no indication of barriers from the company if the respondents wanted to modify their products to improve nutritional quality, for example they did not report being limited by time or resources. Perhaps if there were enough articles about the usefulness of slightly 'healthier' products and the consumer's awareness was raised as in the meat pie example in Auckland (Yee and Young, 2001), some individual food industry professionals might consider nutrition issue at work.

7.2.3 Confidence in one's own ability to improve nutritional quality in food products

Similar to nutrition knowledge, the confidence of one's own ability to improve nutritional quality in food products was found to be correlated with the perception that the company thought nutrition was important. However, as the interviews showed the respondents had no problems in getting technical information, so the causal relationship is likely to be reverse. The meaning is that if they have a need to improve the nutritional quality of a food product, due to the company's brief, the respondents search for additional information and thus increase confidence in their own ability to improve the nutritional quality of food products.

Self confidence was not found to be related to home practices enhancing nutrition. This is likely to be because the self-efficacy construct used in the survey was related to both home and work practices enhancing nutrition. This may have weakened the relationship between self-efficacy and home practices. Also, self confidence was high in general, which is possibly because as

professionals working with food respondents may feel confident that they can learn to do whatever they want. In addition, the respondents may have found that some types of home practices indicated in the questionnaire may be difficult to follow, so this may result in low frequency of home practices.

7.2.4 The perception of the company's and the consumer's view towards the improvement of nutrition quality in food products

The perception of the company's view towards the improvement of nutrition quality in food products appears to be vital to nutrition related work practices. The perception of the company's view about nutrition is likely to be based on the company policy (either formal or informal), which clearly indicates to the respondents the importance of nutrition. Thus, increasing the company's concern about nutrition is important in increasing nutrition related work practices by food industry professionals.

The perception of the consumer's view did not seem to be important for the respondents; this is probably because the consumer's view was discussed in general terms rather than specific for their product. Also in some cases they perceived the consumer to be unconcerned about nutritional quality of food products because of their experience, e.g. consumers buy chocolate for a treat, not for nutritional quality of the product. This is not surprising because nutrition is not the only factor that influences food choice.

7.2.5 Product type

The type of products is an important factor in considering nutritional content at work practices, so it should have been included in the model. Consumers may be more concerned about nutritional value in food products that they commonly eat, but they may not consider nutrition for types of products that they eat occasionally, e.g. snacks (Assema et al, 1999). This view would lead to the demand for the 'healthy' versions for some types of products but not for the others. Food industry professionals then develop nutritionally improved products based on the company's perception of what consumers want.

The type of products may be the reason for lack of the relationship between the perception of the consumer's view about nutrition and work practices because some respondents perceived that consumers care about nutrition but not for the type of products they developed/marketed. Thus the respondents did not apply any work practices to improve nutritional quality in their products. On the other hand, some respondents who have positive perception that consumers care about nutrition

may develop/market products that are commonly chosen because of improved nutritional quality. Because the type of product was not taken into account the result of some negative and some positive relationships between the perception of the consumer's view about nutrition and work practices may have lead to the lack of a statistically significant relationship between these two variables.

From a nutritional point of view, it may be useful to make a 'treat' food slightly healthier. Some people have a 'treat' everyday, even if it's not the same one. If all 'treats' were slightly healthier some people's diets would be slightly healthier. The contrary view that may be common amongst the food industry is that the consumption of the 'treat' food is not regular enough to improve the overall nutritional quality in consumers' diet. Also, consumers do not seem to be concern about nutritional quality for 'treat' foods. Thus the food industry may see no point to make this type of foods 'healthier'.

The discussion above highlights the conflict between the food industry and public health, the food industry has generally been interested in making nutritional changes only if they get a marketing or profit advantage, while from the public health point of view changing people's nutrient intake is the important factor. Therefore, the food industry should be influenced in some ways, e.g. through financial incentives, if the population's health is to be considered in product development.

7.3 Possible influence in increasing 'healthy' food supply:

Government role and lawsuits

There seemed to be no inclination to make the product healthier without informing the consumer, for example as Heinz did in the UK (Dickie, 1993). The respondents did not take the initiative without it being company policy and it did not seem to be company policy. Examples found in this survey were that the company manufactured a variety of products, e.g. standard and 'healthy' products for their marketing benefits. This could be because there has been no incentive from the government as there was in the UK initiative (Richardson, 1995). The Pick the Tick Program in New Zealand sets clear limits of levels of nutrients and there is no incentive to go 'part way' (McClean and Wiseman, 1994), and for some products these levels may result in significant changes in sensory properties. The Nutrition Taskforce in the UK provided financial support for the research investigating ways to make 'healthy' acceptable products, e.g. technical limitations on fat reductions, constraints on consumer acceptance, etc (Richardson, 1995). Moreover, the UK union also allowed the food industry to make nutrition claims in the form of "contains Y percent

less/more of X" where the changes in the nutrient content (e.g. fat) are less than 25 percent (Richardson et al, 1994). Perhaps in New Zealand more support from the government could result in foods across the range becoming healthier with the consumers' food choice being the same.

Another possible motivation for the food company to develop nutritionally modified products is from lawsuits. An example is that the Kraft company in the US plans to set nutrition guidelines for the company to improve the nutrition quality in all of their products by making small changes (Horovitz, 2003). Although the company indicated the reason of setting up the nutrition policy is to reduce the obesity for the population, this initiative might be partly motivated by lawsuits currently being brought against companies in the US. This is the result of consumers who care more about what they eat and some of them blame the food company for their obesity. This is not likely to become a motive in NZ, but if large overseas companies are seen to be doing this there might be motivation for NZ companies to follow in terms of market and publicity.

7.4 Comparison of web based and paper based survey

The lower response rate in the web based than the paper based survey suggests that people still prefer to do the survey via the paper based survey. Several studies have found that response rates for internet surveys are lower than mail surveys (Medin et al, 1999; Cooper et al, 1999). The reasons are possibly because respondents lack familiarity with using internet or they did not have convenient access to the internet (Solomon, 2001). Another reason may be that the web survey address was sent via the postal letter and the respondents had to type in the web survey address on the computer, which they might have found it inconvenient. If the web survey address was sent directly to respondent's contact email, they could have just clicked on the web address to access to the web questionnaire; this may have promoted a higher responses rate.

Another issue raised is that respondents may prefer to answer the open ended questions via web based survey than paper based survey. This may be because it is easier to type in the long answers on the computer than write on the paper, where there might not be much space to write on the paper survey. With the web survey it is also easier to edit answers for content and spelling. Moreover, respondents might see that the paper questionnaire was long so they did not want to spend time to answer the open ended questions. However, the respondents who did the web survey were shown only one page of questionnaire at a time and did not know how many pages there were in total, so they might feel more comfortable to complete all the answers on a page.

7.5 Survey limitations

This was a small exploratory study, although a larger more representative sample would have been preferable, some information can still be learned from the existing survey.

In interpreting the results an issue that needs to be considered is that this study may have non-response bias due to self-selection and the small sample size may mean that the respondents who responded to survey were not representative of food industry professionals in New Zealand. People with little interest in the topic tend not to respond at all, while those with strong interest may respond more frequently (Holbert and Speece, 1993). An article by Internet audience research (2003) suggests that in order to avoid non-response bias, the response rate should be about 70% or more. However, this high response rate is unlikely for a mail survey and the response rates between 10% and 30%, which happened in this study, are not uncommon (Boyd and Westfall, 1972; Luck et al, 1970). Thus nutrition knowledge and attitude may be more positive than in the total population of food technologists. This would have tended to overestimate any relationship between these personal attributes and work practices. Moreover, the method of sample selection by using telephone books may have lead to missing some contacts of food industry professionals in New Zealand or the surveys sent without indicating the names of the respondent may not have gotten to the right people in the company.

Unfortunately, the time that the survey was sent was the start of a busy time of the year in New Zealand (November, 2001), so perhaps respondents did not have time to reply the survey. This may have contributed to the low response rate for this study.

The measurement tools used to examine variables in this study were compiled from the literature and consulting with 'experts' in nutrition and food technology, but they were not tested for validity. Measurement tools that lack validity may lead to missing relationships, this is suggested by the low variance accounted for in the model. This might be improved by improvement to the measurements tools or by addition of more important factors in the model, e.g. the type of product. More qualitative research with the food industry professionals carried out before the questionnaire is designed would help to determine the factors relevant in the model.

In addition, some of the data from the web survey was missing. There was no report of age group for respondents who did the questionnaire through the web survey. This was due to an error in the web survey design. Thus, comparison of response rate related to age could not be carried out.

The long follow-up time to interviews meant that some respondents had moved on and could not be contacted. Moreover, the data quality of the interviews could have been better if all the interviews were conducted face-to-face, but the interviews were conducted using both telephone and personal interviews due to the barriers of time and cost to travel a long distance. The data quality of the phone interviews may not be as good as personal interviews. The respondents are more inclined to give truthful answers if they are interviewed face-to-face and the ability of the interviewer to explain things is better in a personal interview (Holbert and Speece, 1993). However, the personal interview may be associated with more bias attributable to the interviewer than in the telephone interview. The interviewer's facial expression, tone of voice, etc. may lead the respondents to answer the questions in one way (Holbert and Speece, 1993).

7.6 Future research

Future research could start with the examination of factors related to the level of consideration given to nutrition by the food companies. This would help identify ways to encourage the food companies to consider nutrition. Examples of the factors that should be investigated are company policies and type of products. Areas of interest include the reasons why some companies have a formal nutrition policy and others do not, and why some food products are commonly developed as nutritionally modified products but some are not.

Taking into account changes in the model suggested above, future research could be conducted on a larger scale with more representative sample size.

Another topic that could be examined is food companies' views towards universal small changes (e.g. as undertaken by Heinz and Kraft) vs the made for marketing nutritional changes. This may help in examining the factors that are important for each type of changes, e.g. the type of products, consumer acceptance, etc. and may help in determining the type of changes that are suitable for each food company.

7.7 Conclusion

The importance of the company's view towards nutrition is the main influence in work practices related to nutrition. Thus if the government wants to influence the public health, one way is by influencing food companies through providing financial incentives for research about the development of acceptable 'healthier' products. Increased interest in nutrition by food companies may result in consideration of nutrition by individual food industry professionals. Another possible

way to encourage a 'healthier' food supply is to increase consumers' interest in nutrition, e.g. the government may encourage the consumers to read nutrition labels regularly and compare nutrition information between brands, etc. This may lead to the motivation for the food industry to develop/market 'healthier' food products.

8. Appendices

Appendix 4.1: The invitation letter

Letter for respondents who were asked to answer the paper questionnaire

Dear ...,

Eat to Live OR *Live to Eat*- which do you agree with?

There is a wide range of opinions about the importance of nutrition in food product development and marketing. If you think nutrition is just a marketing gimmick then this is the study for you. Conversely if you think all products should be vetted for nutritional content we'd also like to hear from you. Fence sitters are welcome too!

I am surveying the opinions of food technologists and marketers on this issue as part of a Masterate project at Massey University. To get reliable results I need as diverse range of food industry professionals as possible to complete the study. Therefore if you know of any of your colleagues that might be interested in this study please pass them this letter so they can contact us.

As you look at your busy desk do you ask what do I get out of it? All participants will get a copy of the group results. Would you like to see where you sit on the issue? You also have a chance to win a book voucher.

Further information is provided in the attached information sheet. If you have any questions, please feel free to contact us.

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Yours faithfully.

Chayanut Osornprasoph
Masterate Student, Institute of Food, Nutrition, and Human Health
Massey University

Letter for respondents who were asked to answer the web survey

Dear ...,

Eat to Live OR *Live to Eat*- which do you agree with?

There is a wide range of opinions about the importance of nutrition in food product development and marketing. If you think nutrition is just a marketing gimmick then this is the study for you. Conversely if you think all products should be vetted for nutritional content we'd also like to here from you. Fence sitters are welcome too!

I am surveying the opinions of food technologists and marketers on this issue as part of a Masterate project at Massey University. To get reliable results I need as diverse range of food industry professionals as possible to complete the study. Therefore if you know of any of your colleagues that might be interested in this study please pass them the web site address.

As you look at your busy desk do you ask what do I get out of it? All participants will get a copy of the group results. Would you like to see where you sit on the issue? You also have a chance to win a book voucher.

To participate in this study, please see our web site: http://food.massey.ac.nz/food_survey
Further information is provided in the attached information sheet. If you have any questions, please feel free to contact us.

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Yours faithfully,

Chayanut Osornprasoph
Masterate Student, Institute of Food, Nutrition, and Human Health
Massey University

Appendix 4.2: The information sheet

Information Sheet

The aim of this study is to examine food industry professionals' views towards nutrition. I am Chayanut Osornprasoph, the researcher for this study. I am currently studying for a Master of Technology in Food Technology at Massey Universtiy. My supervisors for the project are Dr.Janet Weber and Ms. Carol Pound.

If you would like to take part in this study just complete the simple questionnaire. The questionnaire will ask about your knowledge and attitudes towards nutrition issues. We estimate that the survey will take approximately 20 minutes to complete. *Every persons who returns a complete questionnaire by 15 December 2001 will be placed in a draw to win a book voucher. The chances to win do not depend on the answers given!*

Your names were obtained from the list of food manufacturers and confectioners in the telephone books. To get the reliable results, it's crucial that you and no one else completes the questionnaire and that you answer all the questions based on your own knowledge, not from other resources. The identification number is used simply to check whether we have received your questionnaire back. If we have not heard from you by 15 December 2001 then we will follow up, once only, with a written reminder. Your responses will be confidential and your name will not appear in the results

Your participation is absolutely voluntary and you can decline to answer any particular question. It is assumed that filling in the questionnaire implies your consent to participate in this survey. Results of this survey will be used for Masterate thesis. If you would like a summary of these results for yourself, simply write or e-mail requesting "copy of results" along with your contact details.

After collation of the results from the survey I would like to interview some of the respondents to get more details about their views and practices. If you may be willing to

be interviewed at a later date please indicate this at the end of the questionnaire. I will then send you further information.

We would be happy to answer any questions you might have regarding the research project. Please phone or email any of the team listed below. This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Thank you for your assistance!

Appendix 4.3: The questionnaire

Code number.....

Nutrition knowledge, attitudes and practices of food industry professionals

Introduction

There are differing views about the application of nutrition in the development and marketing of food products. Is it a waste of time or is it a useful factor to consider when developing and marketing a product? We'd like your opinion.

As you are involved in the process of developing or marketing food products, we would like to ask you some questions about your nutrition knowledge, attitudes, and practices both in your personal life and as it applies to your professional life.

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Part 1

This part of the questionnaire is to ask you some nutritional knowledge questions. Please answer them to the best of your knowledge, do not use additional resources. Please tick in the box for your answer.

Q1: Based on your knowledge, do you believe these statements are true or false?

	True	False
a. Saturated fats are usually found in animal products like meat and dairy products.	<input type="checkbox"/>	<input type="checkbox"/>
b. Olive oil is a good source of omega-3 fatty acids.	<input type="checkbox"/>	<input type="checkbox"/>
c. Folate intake is related to blood homocysteine levels.	<input type="checkbox"/>	<input type="checkbox"/>
d. Margarine is lower in calories than butter.	<input type="checkbox"/>	<input type="checkbox"/>
e. If a fat or oil has been hydrogenated, it has become more saturated.	<input type="checkbox"/>	<input type="checkbox"/>
f. Consuming wheat cereal helps lower blood cholesterol.	<input type="checkbox"/>	<input type="checkbox"/>
g. Meat is a good source of fibre.	<input type="checkbox"/>	<input type="checkbox"/>
h. Antioxidants may provide protection against cancer.	<input type="checkbox"/>	<input type="checkbox"/>

	True	False
i. Iron is a type of antioxidant.	<input type="checkbox"/>	<input type="checkbox"/>
j. The amount of fruits and vegetables that a person should eat each day is 1-2 servings.	<input type="checkbox"/>	<input type="checkbox"/>
k. Vitamin D helps in the absorption of iron.	<input type="checkbox"/>	<input type="checkbox"/>
l. High intake of protein and sodium increases the risk of osteoporosis.	<input type="checkbox"/>	<input type="checkbox"/>
m. Folate which is added to food is more available to the body than is folate naturally present in food.	<input type="checkbox"/>	<input type="checkbox"/>
n. Cooked carrots provide more available antioxidants than raw carrots.	<input type="checkbox"/>	<input type="checkbox"/>

Q2: Please rank the following according to the amount of the component, with 1 being the highest amount and 4 being the lowest amount.

Fibre:

.....30 g Lamb chops

.....30 g Sliced white bread

.....30 g Weetbix

.....30 g Apple

Sodium:

.....15 g Margarine

.....15 g Bread

.....15 g Cheese

.....15 g Chippies

Fat:

.....15 ml Cola

.....15 g Potato

.....15 g Chocolate

.....15 g Roasted peanuts

Part 2

This part of the questionnaire is to explore your own attitudes to food and nutrition. Please select the box for your answer.

Q3: To what extent do you agree with the following statements?

	strongly agree	Agree	neither agree nor disagree	disagree	strongly disagree
a. It's important to provide customers with a nutrition label.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Understanding nutrition labels is difficult.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	strongly agree	Agree	neither agree nor disagree	disagree	strongly disagree
c. Most vegetables taste good.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. 6 or more servings of breads and cereals each day is good for your health.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Wholemeal bread tastes better than white bread.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I know how to modify a recipe to reduce fat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Salt is necessary to attain a food's optimal flavor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Recipe modification to make a healthier product is time consuming.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. It's important in my cooking at home to use canola oil when I need to use oil.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Ingredients like butter, oil, and cream are necessary to attain the richest mouthfeel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. I know how to modify a recipe to reduce salt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. It's important in my cooking at home to have reduced-fat products available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. I can eat and drink anything as long as I take lots of exercise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. It's important in my cooking at home to limit use of refined sugar.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. High sugar foods are better for me than high fat foods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. I'm confused by the publications that give nutrition advice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	strongly agree	Agree	neither agree nor disagree	disagree	strongly disagree
q. It's important in my cooking at home to include vegetables in at least 2 meals per day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. Enjoying the taste of food is the most important thing for me, so I don't worry much about what I should eat for my health.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
s. Low fat foods are less satisfying than full fat foods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q4: What 5 pieces of advice about food and nutrition would you give to university students about how to stay healthy and live a long time?

1. _____
2. _____
3. _____
4. _____
5. _____

Q5: What are the good things about your own diet at the moment?

Q6: What are the bad things about your own diet at the moment?

Q7: What are your 2 main sources of information about nutrition?

Part 3

Below are questions about the application of nutrition knowledge in your professional role.

Q8: To what extent do you agree with the following statement?

	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree	not applicable
a. My company thinks it's important to reduce fat in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. My company thinks it's important to reduce salt in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. My company thinks nutrition is important for the company image.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. In my role as a food industry professional, it's important to reduce fat in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I know how to make reduced fat products which would be acceptable to the consumer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. In my role as a food professional, it's important to reduce salt in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I know how to make acceptable reduced salt food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	strongly agree	agree	neither agree	disagree	strongly disagree	not applicable

			nor disagree			
h. in my role as a food industry professional it's important to consider the nutritional aspects of food products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. In my role as a food professional I know how to improve the nutritional aspects of food products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Consumers think it's important to have a choice of low fat products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Consumers think it's important to have a choice of low salt products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. consumers think about nutrition when they purchase foods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 4

This part of the questionnaire is to determine your cooking practices at home.

Q9: In your home cooking, how often do you follow these practices?

I'm likely to:	Often	Sometimes	Rarely	Never
a. Use herbs and spices instead of salt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Substitute baking, boiling, grilling, or steaming for preparations that are traditionally fried or sauteed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Fry meat using some oil.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Refrigerate stews and soups so I can skim off the solidified fat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I'm likely to:	Often	Sometimes	Rarely	Never
e. Use purees of vegetables, fruits to add moisture to a recipe, instead of fats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Add cheese, butter or another creamy sauce when I eat cooked vegetables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Use skim milk instead of whole milk.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Ask for fish&chips without salt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Choose low fat products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Have fruit when I eat dessert.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Eat fish or poultry instead of red meat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Choose low salt products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Remove skin when I eat chicken.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Read nutrition labels when I go shopping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 5

This part of the questionnaire is to ask for the details about the company you work for.

Q10: What type of products do you manufacture or market?

Q11: What is the size of the company you work for?

- ☐ < 50 Employees
☐ 50-100 Employees
☐ > 100 Employees

Q12: Does your company have a written nutrition policy?

- ☐ Yes ☐ No

Part 6

Below are some questions about your experiences in considering health and nutrition when you develop or market products.

Q13: Have you *developed* a new product or products, in which you applied or considered ways to improve the health or nutrition of consumers during the development stage?

☐ Yes (Please fill in the table below) ☐ No (go to Q14)

How often have you tried to:	Often	Sometimes	Rarely	Never	Not Applicable
a. Add fibre?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Add vitamins or minerals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Reduce fat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Reduce sodium?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Alter the type of fat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Other nutrition benefit (Please state)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please comment on how these products were useful for your company.

.....

.....

.....

Q14: What is the reason you have not considered nutrition when *developing* a new product or products? (You can choose more than one answer.)

- A. It's not a company policy.
- B. It's not stated in the brief.
- C. Someone else is doing it.
- D. I don't have enough time to do it.
- E. I'm not sure how to do it.
- F. I'm not a product developer.
- G. Other (Please state _____)

Q15: Have you *reformulated* a product or products, in which you applied or considered ways to improve the health or nutrition of consumers during the development stage?

- ☐ Yes (Please fill in the table below) ☐ No (go to Q16)

How often have you tried to	Often	Sometimes	Rarely	Never	Not Applicable
a. Add fibre?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Add vitamins or minerals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Reduce fat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Reduce sodium?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Alter the type of fat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Other nutrition benefit (Please state)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please comment on how these products were useful for your company

.....

.....

.....

Q16: What is the reason you have not considered nutrition when *reformulating* a product or products? (You can choose more than one answer.)

- A. It's not a company policy.
- B. It's not stated in the brief.
- C. Someone else is doing it.
- D. I don't have enough time to do it.
- E. I'm not sure how to do it
- F. I'm not a product developer.
- G. Other (Please state _____)

Q17: Have you ever *marketed* a product based on nutrition as the product's point of difference?

- ☐ Yes (Please fill in the table below) ☐ No (go to Q18)

How often have you tried to market a product based on:	Often	Sometimes	Rarely	Never	Not Applicable
a. Addition of fibre?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Addition of vitamins or minerals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Reduction of fat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Reduction of sodium?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Alteration of type of fat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Other nutrition benefit (Please state)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please comment on how these products were useful for your company .

.....

Q18: What is the reason why you have not *marketed* a product based on nutrition as the product's point of difference? (You can choose more than one answer.)

- A. It's not a company policy.
 - B. It's not stated in the brief.
 - C. Someone else is doing it.
 - D. I don't have enough time to do it.
 - E. I'm not sure how to do it.
 - F. I'm not a marketer.
 - G. Other (Please state _____)
-

Part 7

Finally we would like to ask you some demographic questions.

Q19: What is your gender?

- ☐ Male ☐ Female
-

Q20: To what age group do you belong?

- | | | |
|--|--|--|
| <input type="checkbox"/> < 20 years old | <input type="checkbox"/> 31-40 years old | <input type="checkbox"/> 51-60 years old |
| <input type="checkbox"/> 20-30 years old | <input type="checkbox"/> 41-50 years old | <input type="checkbox"/> > 60 years old |
-

Q21: What is your position in the company?

- | | |
|--|---|
| <input type="checkbox"/> Product developer | <input type="checkbox"/> Quality control technologist |
| <input type="checkbox"/> Food technologist | <input type="checkbox"/> Marketer |
| <input type="checkbox"/> Technical manager | <input type="checkbox"/> Sensory evaluation |
| <input type="checkbox"/> Production manager | <input type="checkbox"/> Research and development manager |
| <input type="checkbox"/> Packaging technologist | |
| <input type="checkbox"/> Other (please state: _____) | |
-

Q22: What is your highest level of formal education?

- ☐ Secondary school
- ☐ Undergraduate degree; Specialty (please state) _____
- ☐ Post graduate; ☐ Diploma
- ☐ Masters
- ☐ PhD
-

Q23: How many nutrition papers have you completed?

- ☐ 0 paper ☐ 1 paper ☐ 2-5 papers ☐ > 5 papers
-

Q24: What level of nutrition papers have you taken? (Please state, e.g. undergraduate)

Code number.....

[this page will be seperated from the rest of the questionnaire upon receipt]

Please give your contact details below if you would like to enter in the draw for the book voucher or if you would like a copy of results.

(This information will be confidential and will be separated from the questionnaire.)

Name: _____

Address: _____

Phone number: _____

Email address: _____

Please tick in the box below if you would be willing to participate further in this study.

☐ I am willing to be contacted about further participation in this study.
(contact details provided above)

Please tick in the box below if you would like to get a copy of the results of this study.

☐ I would like to get a copy of the results of this study. (contact details provided above)

Thank you very much for your cooperation!

Appendix 4.4: follow-up letters

Follow-up letters to the respondents who were asked to reply to the paper based survey

Dear (Name),

A couple of weeks ago, you were invited to participate in the survey of food technologists and marketers' opinions about the importance of nutrition in food product development and marketing. This study is part of a Masterate project at Massey University.

If you have completed and returned the questionnaire, in the last few days, please accept my sincere thanks. If not, I would be grateful if you could complete the survey and return it. To get reliable results I need as diverse a range of food industry professionals as possible to complete the study.

Further information is provided in the attached information sheet; another copy of information sheet and questionnaire is enclosed so you don't need to hunt your in-trays to find the last one I sent.

I look forward to receiving your questionnaire. If you have any questions, please feel free to contact us.

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Yours faithfully,

Chayanut Osornprasoph
Masterate Student, Institute of Food, Nutrition, and Human Health

Follow-up letters to the respondents who were asked to reply to the paper based survey

Dear (Name),

A couple of weeks ago, you were invited to participate in the survey of food technologists and marketers' opinions about the importance of nutrition in food product development and marketing. This study is part of a Masterate project at Massey University.

If you have completed and sent the questionnaire already, please accept my sincere thanks. If not, could you please complete and return it today? It's very important that you do your best to complete it and return it, because the more replies we receive, the more accurate and useful the information we obtain is.

To get reliable results I need as diverse a range food industry professionals as possible to complete the study. Therefore if you know of any of your colleagues that might be interested in this study please pass them the web site address.

I look forward to receiving your questionnaire; another copy of information sheet is enclosed in case the previous has lost. If you have any questions, please feel free to contact us.

To participate in this study, please see our web site: http://food.massey.ac.nz/food_survey
Further information is provided in the attached information sheet. If you have any questions, please feel free to contact us.

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Yours faithfully.

Chayanut Osornprasoph
Masterate Student, Institute of Food, Nutrition, and Human Health

Appendix 4.5: The pretest questionnaire

Introduction

There are differing views about the application of nutrition in the development and marketing of food products. Is it an important factor when developing and marketing a product or not? We'd like your opinion.

As you are involved in the process of developing or marketing food products, we would like to ask you some questions about your nutrition knowledge, attitudes, and practices both in your personal life and as it applies to your professional life.

Part 1

This part of the questionnaire is to ask you some nutritional knowledge questions. Please answer them to the best of your knowledge, do not use additional resources. Please tick in the box for your answer.

Q1: Based on your knowledge, do you believe these statements are true or false?

	True	False
a. Saturated fats are usually found in animal products like meat and dairy products.	<input type="checkbox"/>	<input type="checkbox"/>
b. Olive oil is a good source of omega-3 fatty acids.	<input type="checkbox"/>	<input type="checkbox"/>
c. Polyunsaturated fats are more likely to be in a liquid form than in a solid form.	<input type="checkbox"/>	<input type="checkbox"/>
d. A diet high in saturated fats is likely to raise people's blood cholesterol level.	<input type="checkbox"/>	<input type="checkbox"/>
e. If a food is labeled cholesterol free, it is also low in saturated fats.	<input type="checkbox"/>	<input type="checkbox"/>
f. Margarine is lower in calories than butter.	<input type="checkbox"/>	<input type="checkbox"/>
g. If a fat or oil has been hydrogenated, it has become more saturated.	<input type="checkbox"/>	<input type="checkbox"/>
h. You can reduce the amount of fat in a formulation by substitute olive oil for butter	<input type="checkbox"/>	<input type="checkbox"/>
i. Consuming wheat cereal helps lower blood cholesterol.	<input type="checkbox"/>	<input type="checkbox"/>
j. Meat is a good source of fibre.	<input type="checkbox"/>	<input type="checkbox"/>

	True	False
k. A gram of carbohydrate has less than half as many calories as a gram of fat.	<input type="checkbox"/>	<input type="checkbox"/>
l. Antioxidants provide protection against cancer.	<input type="checkbox"/>	<input type="checkbox"/>
m. Green and yellow leafy vegetables contain antioxidants	<input type="checkbox"/>	<input type="checkbox"/>
n. Iron is a type of antioxidants.	<input type="checkbox"/>	<input type="checkbox"/>
o. The amount of fruits and vegetables that a person should eat each day is 1-2 servings.	<input type="checkbox"/>	<input type="checkbox"/>
p. Eating too many salty foods can cause hypertension.	<input type="checkbox"/>	<input type="checkbox"/>
q. Vitamin D helps in the absorption of iron.	<input type="checkbox"/>	<input type="checkbox"/>
r. Milk consumption can prevent bone fracture.	<input type="checkbox"/>	<input type="checkbox"/>
s. High intake of protein and sodium increases the risk of osteoporosis.	<input type="checkbox"/>	<input type="checkbox"/>
t. Folate which is added to food is more available to the body than is folate naturally present in food.	<input type="checkbox"/>	<input type="checkbox"/>
u. Raw carrots provide less available antioxidants than cooked carrots.	<input type="checkbox"/>	<input type="checkbox"/>

Q2: Please rank the following according to the amount of the component, with 1 being the highest amount and 4 being the lowest amount.

Fibre:	Sodium:	Fat:
.....30 g Lamb chops15 g Margarine15 ml Cola
.....30 g Sliced white bread15 g Bread15 g Potato
.....30 g Weetbix15 g Cheese15 g Chocolate
.....30 g Apple15 g Chippies15 g Roasted peanuts

Part 2

This part of the questionnaire is to explore your own attitudes to food and nutrition. Please select the box for your answer.

Q3: To what extent do you agree with the following statements?

	strongly agree	Agree	neither agree nor disagree	disagree	strongly disagree
a. By eating the right kinds of foods, people can reduce their chance of developing a major disease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vitamin C prevents cold.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Most vegetables taste good.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Frying is a convenient way to cook.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Bread and potatoes are fattening foods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Wholemeal bread tastes better than white bread.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Salt is necessary to attain a food's optimal flavor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. No one buys low salt products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. White bread is bad for you.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Ingredients like butter, oil, and cream are necessary to attain the richest mouthfeel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. It's important in my cooking at home to have reduced-fat products available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. I can eat and drink anything as long as I take lots of exercise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Enjoying the taste of food is the most important thing for me, so I don't worry much about what I should eat for my health.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Eating dessert after main meal is important to fill me up.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q4: What 5 pieces of advice about food and nutrition would you give to university students about how to stay healthy and live a long time?

1. _____
2. _____
3. _____
4. _____
5. _____

Q5: What are the good things about your own diet at the moment?

Q6: What are the bad things about your own diet at the moment?

Part 3

Below are questions about the application of nutrition knowledge in your professional role.

Q7: To what extent do you agree with the following statement?

[illegible]

	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree	not applicable
c. As a consumer, I think it's important to reduce fat in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. My company thinks it's important to reduce salt in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. In my role as a food professional, it's important to reduce salt in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. As a consumers, I think it's important to reduce salt in food products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 4

This part of the questionnaire is to determine your cooking practices at home.

Q8: In your home cooking, how often do you follow these practices?

I'm likely to:	Often	Sometimes	Rarely	Never
a. Use herbs and spices instead of salt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Substitute baking, boiling, grilling, or steaming for preparations that are traditionally fried or sauteed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Refrigerate stews and soups so I can skim off the solidified fat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use purees of vegetables, fruits to add moisture to a recipe, instead of fats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Reduce portion size of meat and substitute with bean and grains.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Use substitutes, such as fruit juices or broth, for oil in dressings and marinades.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I'm likely to:	Often	Sometimes	Rarely	Never
g. Use fruit juices or fruit concentrates instead of sugar to add sweetness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Use skim milk instead of whole milk.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Eat special, low fat cheeses, when I eat cheese.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Ask for fish&chips without salt from takeaway.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Use low calorie instead of regular salad dressing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Have fruit when I eat dessert.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Eat fish or poultry instead of red meat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Add butter, margarine or sour cream when I eat baked or boiled potatoes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. Add cheese, butter or another creamy sauce when I eat cooked vegetables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. Fry meat using some oil.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. Remove skin when I eat chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 5

This part of the questionnaire is to ask for the details about the company you work for.

Q9: What type of products do you manufacture or market?

Q10: What is the size of the company you work for?

- ☐ < 50 Employees
☐ 50-100 Employees
☐ > 100 Employees
-

Q11: Does your company have a written nutrition policy?

- ☐ Yes ☐ No
-

Part 6

Below are some questions about your experiences in considering health and nutrition when you develop or market products.

Q12: Have you *developed* a new product or products, in which you applied or considered ways to improve the health or nutrition of consumers during the development stage?

- ☐ Yes ☐ No (go to Q16)
-

Q13: How often have you tried to minimize salt when developing a new product or products?

- A. Often D. Never
B. Sometimes E. Not applicable
C. Rarely
-

Q14: How often have you tried to minimize fat when developing a new product or products?

- A. Often D. Never
B. Sometimes E. Not applicable
C. Rarely
-

Q15: How often have you tried to minimize other ingredient (please specify) _____ when developing a new product or products?

- A. Often D. Never
B. Sometimes E. Not applicable
C. Rarely
-

Q16: What is the reason you have not considered nutrition when *developing* a new product or products? (You can choose more than one answer.)

- A. It's not a company policy.
 - B. I'm not a product developer.
 - C. Someone else is doing it.
 - D. I don't have enough time to do it.
 - E. Other (Please state _____)
-

Q17: Have you *reformulate* a product or products, in which you applied or considered ways to improve the health or nutrition of consumers during the development stage?

☐ Yes

☐ No (go to Q21)

Q18:How often have you tried to minimize salt when reformulating a product or products?

- | | |
|--------------|-------------------|
| A. Often | D. Never |
| B. Sometimes | E. Not applicable |
| C. Rarely | |
-

Q19:How often have you tried to minimize fat when reformulating a product or products?

- | | |
|--------------|-------------------|
| A. Often | D. Never |
| B. Sometimes | E. Not applicable |
| C. Rarely | |
-

Q20:How often have you tried to minimize other ingredient (please specify) _____ when reformulating a product or products?

- | | |
|--------------|-------------------|
| A. Often | D. Never |
| B. Sometimes | E. Not applicable |
| C. Rarely | |
-

Q21: What is the reason you have not considered nutrition when *reformulating* a product or products?

- A. It's not a company policy.
 - B. I'm not a product developer.
 - C. Someone else is doing it.
 - D. I don't have enough time to do it.
 - E. Other (Please state _____)
-

Q22: Have you *ever marketed* a product based on nutrition as the product's point of difference?

☐ Yes

☐ No (go to Q26)

Q23:How often have you tried to market a product based on the minimization of salt as the product's point of difference?

- | | |
|--------------|-------------------|
| A. Often | D. Never |
| B. Sometimes | E. Not applicable |
| C. Rarely | |
-

Q24:How often have you tried to market a product based on the minimization of fat as the product's point of difference?

- | | |
|--------------|-------------------|
| A. Often | D. Never |
| B. Sometimes | E. Not applicable |
| C. Rarely | |
-

Q25:How often have you tried to market a product based on the minimization of other ingredient (please specify) _____ as the product's point of difference?

- | | |
|--------------|-------------------|
| A. Often | D. Never |
| B. Sometimes | E. Not applicable |
| C. Rarely | |
-

Q26: What is the reason you have not *marketed* a product based on nutrition as the product's point of difference?

A. It's not a company policy.

B. I'm not a marketer.

C. Someone else is doing it.

D. I don't have enough time to do it.

E. Other (Please state _____)

Part 7

Finally we would like to ask you some demographic questions.

Q27: What is your gender?

☐ Male

☐ Female

Q28: To what age group do you belong?

☐ < 20 years old

☐ 31-40 years old

☐ 51-60 years old

☐ 20-30 years old

☐ 41-50 years old

☐ > 60 years old

Q29: What is your position in the company?

☐ Product developer

☐ Quality control technologist

☐ Food technologist

☐ Marketer

☐ Technical manager

☐ Sensory evaluation

☐ Production manager

☐ Research and development manager

☐ Packaging technologist

☐ Other (please state: _____)

Q30: What is your highest level of formal education?

- ☐ Secondary school
☐ Undergraduate degree; Specialty (please state) _____
☐ Post graduate; ☐ Diploma
 ☐ Masters
 ☐ PhD

Q31: How many nutrition papers have you completed?

- ☐ 0 paper ☐ 1 paper ☐ 2-5 papers ☐ > 5 papers

Q32: What level of nutrition papers have you taken? (Please state, e.g. undergraduate)

[this will be seperated from the rest of the questionnaire upon receipt]

Please give your contact details below if you would like to enter in the draw for the book voucher or if you would like a copy of results.

(This information will be confidential and will be separated from the questionnaire.)

Name: _____

Address: _____

Phone number: _____

Email address: _____

Please tick in the box below if you would be willing to participate further in this study.

- ☐ I am willing to be contacted about further participation in this study.
 (contact details provided above)

Please tick in the box below if you would like to get a copy of the results of this study.

☐

I would like to get a copy of the results of this study. (contact details provided above)

Thank you very much for your cooperation!

Appendix 4.6: The interview information sheet

Interview Information Sheet

Thank you for your cooperation in the first study and your willingness to participate in this interview. This letter is to provide you with information about the interview which is the second part of my study. I am Chayanut Osornprasoph, the researcher, currently studying for a Master of Technology (Food Technology) at Massey Universtiy. My supervisors for the project are Dr.Janet Weber and Ms. Carol Pound.

The objective of this interview is to explore the information gathered, about nutrition application at work, expanding on the results of the original questionnaire. The questionnaire is enclosed for your reference.

The interview will be conducted in person, or by telephone, depending on your distance from Palmerston North. A few days after you have received this letter, we will contact you by telephone to make an appointment if you are still willing and able to participate in the interview.

Your answers will be recorded will be strictly confidential, your name will not appear in any results. Your participation is voluntary and you can decline to answer any particular question. Results of this survey will be used for a Masterate thesis.

We would be happy to answer any questions you might have regarding the research project. Please phone or email any of the team listed below. This project has been reviewed and approved by the Massey University Human Ethics Committee, PN, Protocol 01/102.

Thank you for your assistance!

Appendix 4.7: The interview schedule

1. The importance of company nutrition policy

Does your company have a formal nutrition policy?

Yes

No

Is it useful? / Do you apply to all products?

Is nutrition important?

Do the messages come from any one
in the company that nutrition is/is not
important?

How long do you have to develop a product?

What are the main drivers in product development?

Does nutrition fit into the main drivers?

2. Personal concerns about nutrition

I'd like to ask for your personal opinion about nutrition.

What is the most important issue for your self?

Does your personal attitude about nutrition affect what you've done at work?

Have you tried to improve nutrition quality in your product?

Yes

No

What aspects of nutrition?

e.g. fat reduction

If you have a chance to do it,
what would you do?

Does your company still make the high fat version?

Does someone tell you to do it?(high&low fat version)

Where do you get the information of know-how to reduce fat?

Are there any hard technical issues about reducing fat?

When you make low fat products, do you try to replicate the full fat one?

Do you think your concern about nutrition have changed

since you've improved nutrition quality in your products?

What are important barriers to improve nutrition quality?

Do you buy any of your own products?

3. Nutrition labels

What do you read the labels for?

Which products do you read labels?

How do you use it?

How do other people choose general products based on?

How do other people choose your products based on?

Does the new label regulation force you to change your product's formulation?

Yes

No

What aspect?

Under the new regulation, people can compare the amount of nutrients or additives in every product, do you think this will make a difference to your consumers?

Appendix 5.1: Responses of nutrition knowledge questions

Nutrition knowledge questions	% respondents who get the answers correct
Saturated fats are usually found in animal products like meat and dairy products. (T)	91
Olive oil is a good source of omega-3 fatty acids. (F)	54
Folate intake is related to blood homocysteine levels. (T)	30
Margarine is lower in calories than butter. (F)	74
If a fat or oil has been hydrogenated, it has become more saturated. (T)	65
Consuming wheat cereal helps lower blood cholesterol. (F)	50
Meat is a good source of fibre. (F)	91
Antioxidants may provide protection against cancer. (T)	96
Iron is a type of antioxidant. (F)	83
The amount of fruits and vegetables that a person should eat each day is 1-2 servings. (F)	85
Vitamin D helps in the absorption of iron. (F)	46
High intake of protein and sodium increases the risk of osteoporosis. (T)	20
Folate which is added to food is more available to the body than is folate naturally present in food. (T)	13
Cooked carrots provide more available antioxidants than raw carrots. (T)	15
Ranking of fibre content:	
- 30 g Lamb chops (4)	83
- 30 g Slice white bread (2)	30
- 30 g Weetbix (1)	76
- 30 g Apple (3)	24
Ranking of sodium content	
- 15 g Margarine (1)	11
- 15 g Bread (2)	13
- 15 g Cheese (3)	26
- 15 g Chippies (4)	13
Ranking of fat content	
- 15 ml Cola (4)	83
- 15 g Potato (3)	76
- 15 g Chocolate (2)	59
- 15 g Roasted peanuts (1)	65

Appendix 5.2: Responses of nutrition attitude questions

Statements examined attitudes towards nutrition	% Responses		
	Favourable (score 4-5)	Not favourable (score 1-2)	Neutral (score 3)
It's important to provide customers with a nutrition label.	91	4	5
Understanding nutrition labels is difficult.	48	43	9
Most vegetables taste good.	74	17	9
6 or more servings of breads and cereals each day is good for your health.	41	3	56
Wholemeal bread tastes better than white bread.	50	17	33
Salt is necessary to attain a food's optimal flavor.	30	41	29
Recipe modification to make a healthier product is time consuming.	48	30	22
It's important in my cooking at home to use canola oil when I need to use oil.	15	61	24
Ingredients like butter, oil, and cream are necessary to attain the richest mouthfeel.	43	43	14
It's important in my cooking at home to have reduced-fat products available.	54	30	16
I can eat and drink anything as long as I take lots of exercise.	70	22	8
It's important in my cooking at home to limit use of refined sugar.	26	50	24
High sugar foods are better for me than high fat foods.	52	17	31
I'm confused by the publications that give nutrition advice.	50	20	30
It's important in my cooking at home to include vegetables in at least 2 meals per day.	76	9	15
Enjoying the taste of food is the most important thing for me, so I don't worry much about what I should eat for my health.	70	17	13
Low fat foods are less satisfying than full fat foods.	46	33	21
In my role as a food industry professional, it's important to reduce fat in food products.	37	28	35
In my role as a food professional, it's important to reduce salt in food products.	30	22	48
In my role as a food industry professional it's important to consider the nutritional aspects of food products.	80	4	16

Appendix 5.3: Responses of questions regarding confidence in own ability to improve nutritional quality in foods

Statements examined confidence in own ability to improve nutritional quality in foods	% Responses		
	Favourable (score 4-5)	Not favourable (score 1-2)	Neutral (score 3)
I know how to modify a recipe to reduce fat.	87	2	11
I know how to modify a recipe to reduce salt.	89	2	9
I know how to make reduced fat products which would be acceptable to the consumer.	67	4	29
I know how to make acceptable reduced salt food products.	61	2	37
In my role as a food professional I know how to improve the nutritional aspects of food products	80	2	18

Appendix 5.4: Responses of questions regarding the importance of others' view towards the development/marketing of nutritionally improved products

Statements examined the importance of others' view towards development of nutritional products	% Responses		
	Favourable (score 4-5)	Not favourable (score 1-2)	Neutral (score 3)
My company thinks it's important to reduce fat in food products.	37	17	46
My company thinks it's important to reduce salt in food products.	37	13	50
My company thinks nutrition is important for the company image.	63	9	28
Consumers think it's important to have a choice of low fat products.	93	0	7
Consumers think it's important to have a choice of low salt products.	72	9	19
Consumers think about nutrition when they purchase foods.	50	13	37

Appendix 5.5: Responses of questions regarding nutrition related food practices at home

Frequency of nutrition related food practices at home	%Responses		
	High practices (score 2-3)	Low practices (score 0-1)	Blank
Use herbs and spices instead of salt.	80	20	0
Substitute baking, boiling, grilling, or steaming for preparations that are traditionally fried or sauteed.	89	11	0
Fry meat using some oil.	30	70	0
Refrigerate stews and soups so I can skim off the solidified fat.	39	59	2
Use purees of vegetables, fruits to add moisture to a recipe, instead of fats.	59	41	0
Add cheese, butter or another creamy sauce when I eat cooked vegetables.	52	48	0
Use skim milk instead of whole milk.	43	57	0
Ask for fish&chips without salt	13	57	40
Choose low fat products.	74	24	2
Have fruit when I eat dessert.	85	13	2
Eat fish or poultry instead of red meat.	91	9	0
Choose low salt products	46	52	2
Remove skin when I eat chicken.	59	37	4
Read nutrition labels when I go shopping.	76	22	2

Appendix 5.6 : The analysis of general linear model

The relationships of demographic and company factors with *work practice enhancing nutrition*

Demographic and company factors	N	Estimated marginal mean	Standard error	F	p-value
Age					
- 21-40	13	14.08	3.65	0.014	0.907
- 41-60	11	11.80	3.85		
Gender					
- Male	16	13.43	3.198	0.002	0.964
- Female	8	12.78	4.654		
Education					
- Secondary	3	6.67	5.48	1.302	0.299
- Undergraduate	18	18.35	2.26		
- Postgraduate	3	14.25	5.81		
Size of company					
- <50 employees	25	21.29	2.92	1.451	0.249
- 50-100 employees	5	16.40	3.54		
- >100 employees	7	15.25	3.02		
Nutrition policy					
- Yes	6	25.50	3.43	11.820	0.002*
- No	31	12.83	2.01		

* The relationship is statistically significant at $p \leq 0.10$

The relationships of demographic factors with *home practice enhancing nutrition*

Demographic factors	N	Estimated marginal mean	Standard error	F	p-value
Age					
- 21-40	17	24.63	1.96	0.001	0.972
- 41-60	13	22.84	2.06		
Gender					
- Male	20	23.15	1.75	0.034	0.856
- Female	10	24.61	2.40		
Education					
- Secondary	3	21.33	3.12	0.453	0.642
- Undergraduate	22	24.28	1.16		
- Postgraduate	5	25.12	2.53		

The relationships of demographic factors with *nutrition knowledge*

Demographic factors	N	Estimated marginal mean	Standard error	F	p-value
Age					
- 21-40	17	13.03	1.08	0.780	0.388
- 41-60	13	10.05	1.13		
Gender					
- Male	20	12.04	0.96	0.102	0.753
- Female	10	10.79	1.32		
Education					
- Secondary	3	10.00	1.71	2.201	0.137
- Undergraduate	22	14.46	0.63		
- Postgraduate	5	10.50	1.39		

The relationships of demographic factors with *nutrition attitudes*

Demographic factors	N	Estimated marginal mean	Standard error	F	P-value
Age					
- 21-40	17	66.86	3.16	0.267	0.611
- 41-60	13	62.50	3.32		
Gender					
- Male	20	65.39	2.82	0.007	0.934
- Female	10	63.61	3.86		
Education					
- Secondary	3	65.00	5.03	0.554	0.583
- Undergraduate	22	67.76	1.86		
- Postgraduate	5	62.12	4.07		

The relationships of demographic factors with *the confidence of one's own ability to improve nutritional quality in food products*

Demographic factors	N	Estimated marginal mean	Standard error	F	P-value
Age					
- 21-40	17	18.94	1.36	0.418	0.526
- 41-60	13	19.30	1.43		
Gender					
- Male	20	18.68	1.21	0.446	0.512
- Female	10	19.79	1.66		
Education					
- Secondary	3	18.33	2.16	0.321	0.729
- Undergraduate	22	19.24	0.80		
- Postgraduate	5	19.62	1.75		

The relationships of demographic factors with *the perception of the company's and the consumer's views towards the development of nutritionally improved products*

Demographic factors	N	Estimated marginal mean	Standard error	F	P-value
Age					
- 21-40	17	22.06	1.92	0.357	0.557
- 41-60	13	20.20	2.02		
Gender					
- Male	20	21.24	1.72	0.078	0.783
- Female	10	20.96	2.35		
Education					
- Secondary	3	19.67	3.06	0.064	0.938
- Undergraduate	22	22.26	1.13		
- Postgraduate	5	21.37	2.48		

Appendix 6.1: Examples of interview transcripts

Example 1

Does your company have a formal nutrition policy? No.

Do you think nutrition is important for your company?

I wish I did but my experience is that it's not.

- Does the message come from anyone in the company that it's not important?

No, message comes from the products that we sell and the reaction of consumers to what we offer and my experience is that whilst they say that they care about nutrition, they don't really.

- How long do you have to develop a product?

We try stuff all the time, so sometimes it takes a long time and sometimes it's really quick. It's just depends on what happens. We often try something and show it to our biggest customers and if they like then it becomes a product and if they don't then it doesn't and if they think it's got potential then we'll work on it. It just depends on how it goes. We don't have a fixed time program. It depends on what happens.

- What are the main drivers in product development?

Customers.

- Does nutrition fit into the main drivers?

No.

- Personal concern about nutrition: What is the most important issue for yourself?

Weight control. The biggest thing for me is to try to have balance.

- Does your personal attitude about nutrition affect what you've done at work?

Not really. In the end we're a business, we try to make money and we do whatever our customers want. We wish they all cared a great deal about nutrition and their health. It's my experience that they don't.

- Have you tried to improve nutrition quality in your products?

We start with very good nutrition in terms of low fat, healthy, all those good things, but in the end when we put products on the shelf, customers buy or not that's the designing factor. We haven't advertised them too much as low fat products. Generally speaking, our most successful product is the disgustingly high fat unhealthy chicken roll. It's cheap.

- Does your company still market the low fat products?

Yes.

- Does someone tell you to do it?

When we started the company that was our original intention where we're going to be healthy, low fat, high quality, traditional, not extended, not punched, and good. We still have a range of those products, but what the market actually buys is cheap, high fat rubbish.

- Where did you get the information of know-how to reduce fat?

Basically it's just a matter of trimming. We just trim all the visible fat off the meat and that's the basis of the product; obviously it's expensive.

- Are there any hard technical issues about reducing fat?

No.

- When you make low fat product, do you try to replicate full-fat one?

Not really. No. With the low fat product, we do generally the whole muscle product and generally speaking, there's not a lot of fat in the whole muscle, so it's just the nature of the product that it is low fat. Most manufacturers stay away from that because it's much more expensive. We use the prime cut rather than the trimmed.

- Are there other aspect that you have done like reduce salt?

Reducing salt is much more difficult actually because it's two aspects. One is salt is the traditional ingredient in the stuff that we do and if you reduce or eliminate salt you actually change the nature of the product altogether and it becomes not what it is so you can't have 'no salt ham'. Because by the definition, ham is salted meat, so reduce salt, we had quite a good look on going to heart foundation for some of our products and in the end the salt tripped us up, we couldn't meet their salt requirement.

- What do you feel about Pick the Tick program?

It's very expensive to get your approval and for small company like us and we basically couldn't justify it. Also with the salt content, we thought we basically wouldn't be able to comply with any product that we could sell any volumes of, and if you're only selling tiny volumes then you can't justify pay them thousands dollars to give you the Tick. It only works if you're a big volume producer.

- Do you think your concern about nutrition have changed since you've done the nutrition improvement for your product?

You can hear, I'm quite cynical about it all. It's been a big disappointment to us that it appears that every survey that you go to you ask consumers and they tell you how important nutrition is but their behaviour is completely contrary to it. That's frustration to me and I guess my attitude is more cynical than it ever was because of that.

- What are the important barriers to improve nutrition quality?

Basically, price. Good food costs money and consumers generally are reluctant to pay. They might impress everybody once a week. During their normal weekly shopping and their normal week eating they eat rubbish because it's cheap. It's from the result of our sales. We've got some very good products and they sell small quantities and we've got some really rubbish and they sell big quantity and that's basically my experience.

- Do you buy any of your own products?

Yes. Good one though.

- What do you read the nutrition labels for?

I read it for competitive information.

- Which product do you read the labels?

As a food manufacturer, you become a label junky and the only people who read labels are going to be the manufacturers.

- What aspect of nutrition do you look at, what nutrients do you always look at?

Basically, the KJ and the fat, sodium, but more important I look at the ingredients.

What's in the stuff.

- How do you use it?

It doesn't influence my decision very much at all unless there are some really big numbers there that I don't expect to see.

- How do other people choose general products based on?

I don't think more than a few % of the population will understand the information on nutrition labels and I think it's just a whole lot of rubbish to be honest.

Leading: So they choose products based on taste and price?

Yes, Absolutely

- How do other people choose your products based on?

I wish I knew really. Basically, they either habit or most of our stuff is sort of treat stuff, special occasion stuff rather than daily shopping stuff. Although we do have our best selling product is the horrible chicken rolls, cheap and nasty. That one's chosen on price. The other one's chosen on special occasion, party foods sort of things.

- Does the new label regulation force you to change your product formulation?

No, but it has caused us to drop some products because they are low volume products which are not worth printing labels for them. It's not worth going on with these products so just give them up rather than doing new labels for them.

- Under the new regulation, people can now compare the amount of nutrients or additives in every product, do you think this will make a difference to your consumers?

No, but I think some companies and some products will have some troubles; but I think if anything that will help us if anybody actually read the labels which I doubt.

Example 2

Does your company have a formal nutrition policy?

Yes it does.

- Do you think it's useful for your company?

To some extent, it is. But a lot of the stuff you have to improvise spending on what product you're working on. We have a general policy on nutrition, nothing specific. And we have many branches so each branch has to then develop further its own views on certain things.

- Do you apply it to all products?

Yes, we do.

- How long do you have to develop a product?

The shortest time would be something like a packaging change which would be about six months maximum. Minimum period would be about 4 months. So between 4 and 6 months would be a small change. The major development takes place over 18 months.

- What are the main drivers in product development?

It's partly marketing instrument, but also the fact that we have to base most of the products around the fact that we have to manufacture them within a specific parameter in

the factory; we don't have a very big ability to move; we can make emulsion to a certain extent, so we can only limit our development to those basic emulsions that we can make. The major 'capex' projects are run out of Australia which we're not involved in; which involves new products that would take 'capex' of like more than a million dollars or some thing like that. That's not driven by us.

- Does nutrition fit into the main drivers?

Well, at the moment, all of our product development has been nutrition based, more functional foods, all sterols and high omega, lowering the fat levels. Nutrition is almost like in the fourth run of our product development process.

- Personal concern about nutrition.

For myself personally would be a vegetarian diet, because I understand how important it is to have a non meat or non animal protein based diet and just based on a healthy vegetarian diet there is not very much that can go wrong if one is sensible and has the right amount of serves per day. If you overeat you can overeat in either sector and put on weight or have obesity problems or dietary problems in terms of sugar diabetes or things like that. In terms of just a good balanced vegetarian diet, not very much that can go wrong. My personal belief is that to stay healthy you need a good vegetarian diet and then you don't have to pay too much attention, you don't have to worry too much about the other things that can go wrong.

- Does your personal attitude about nutrition affect what you've done at work?

No, it doesn't.

- From the result of questionnaire survey, people listed fat as the most important issue for their nutrition concerns, what do you think about fat?

Based on a company that works with fat, I believe that you need some level of fat in your body for healthy body function, skin development and skin, like that glow look in you. It's very important for skin development. But I feel that there is certain level that everyone should aspire to and because the serving sizes of food all over the world have gone up to such an extent fat is a very important level of contributing factor to obesity and I feel that we as a company should slowly bring those fat levels down in relationship to the serving sizes that are out there at the moment.

- Have you tried to improve nutrition quality in your products?

Yes, we constantly do that.

- Could you tell me some examples?

So far we've gone to lowering all the margarine fat levels. Which means that would assist in giving less KJ per serve to people who consume our products. That will help obesity problem. But also we're slowly cutting down on salt levels as well, that's basically the two main ones, and adding in functional food which would help stop cholesterol from entering into the blood stream.

- What kind of functional food?

Functional food is like the 'Logical' and then the different trans-fatty acid free products. We are starting to develop, which we call 'T-fat,' to try to and come in line with the rest of the countries in the world like the major players in Europe. Most of them have moved away from trans, like moved to trans-free products and Australia has taken the stance to move there as well and we have been a bit slow and slowly starting to come up to level, making products which are in line with the major players in the world are moving.

- Does your company still make the higher fat version?

Yes, we do, but very few and limited number of products.

- Does the message come from anyone in the company to make high fat and low fat version?

The high fat version exists originally from basic formulations that have been created since the company was formed, and those formulations haven't changed. They are our base products which people out there know and like. So there's quite a substantial following for the full fat products. I'm assuming that the people who use the full fat margarine do so sensibly and know what a good serving size is.

- Where do you get the information of know-how to do it?

Most of it is from pilot plant trials. We have a small pilot plant and we run trials there and develop new formulations.

- Are there any hard technical issues about reducing fat?

No. With experience you understand different types of emulsion and what needs to be done. It's only you go to really low fat products, where we get, like if you go to 40% or 30% fat product, we get some technical expertise from other sources.

- Like suppliers?

Yes that would be one and there's lots of patents and journals, which describe certain functional or additives or products which could be used in terms of giving you a good mouthfeel and having the melting properties and stuff like that, that we need in a low fat product.

- When you make low fat product, do you try to replicate full-fat one?

Yes, it's very hard to make a 50% spread the same as a full fat margarine, but there are ways of doing it and we have made successful pilot products of that nature. It just they're not viable financially. You could make a product which is 40% fat which tastes exactly like or even better than a full fat margarine, but the cost of what you make it is probably not viable. So that's where your limiting factors come in, trying to balance out the cost and make a low fat product and having the savings in terms of what you save; putting in 20% less fat, 30% less fat, you can take that and have that as a cost saving; that's what marketing and finance would be driving in the product, but what we would be looking for is to attain the same mouthfeel, the same flavour and physical attributes of the product; but obviously that's where you have to balance everything out.

- Salt: Do you still make the standard version?

Yes, we do, even though the standard version has slightly lower levels than before.

- Does someone tell you to make high and low salt version?

Yes. It's driven by the Heart Foundation.

So if it wasn't for the Pick the Tick, we wouldn't have reduced the salt because salt is not a real problem to us as such in the diet, but we do understand it increases the blood pressure of people and it could seriously impact on health so to obtain the Heart Foundation Tick we reduce the salt and some of those products have been liked by the consumer more than some of the other products, so slowly the salt levels of the others have slowly come down. It basically marketing driven, which is marketing in terms of wanting the Heart Foundation Tick; it's consumer driven by the fact that they actually like and choose the salt reduced versions to the others and makes us move towards slightly lower salt level.

- What do you feel about heart foundation tick?

It's very good, it's just sometimes it's misleading because you'd have Pick the Tick on the oil and people should know that it is a good oil to use but at the end it comes down to

servings. Servings all around the world have gone up and serving sizes have gone up which is the major problem and if you look anywhere in the confectionary industry or in the fast food industry the serving sizes have tripled in the last ten years, so that's where the major problem is coming in, in terms of obesity, people are still having maybe the same serve size but because the serving size has tripled and throughout history you can see with automation most peoples diets lack the motive exercises that they did maybe ten years ago. And you know with doing less exercise and tripling the serving size obviously it's going to lead to a population that's obese. And with obesity comes all the problems of diabetics and all the rest of those.

The Heart Foundation Tick is good, you can have them if you are sensible and have reasonable serving size and obviously will do your heart good. If you double the size then you actually have more than you should have.

- Do you think your concern about nutrition have changed since you've done the nutrition improvement for your product?

Yes. I'd just like to see more products come out which are more natural, products which are more focused on the consumers and focus on the fact that they are good products to sell. That's more on a personal note. My perception has changed a little in terms of working with products with more nutrition in them, I've started using products myself, like olive oil, margarine I start using now. That's just purely from understanding what the oil does.

- So you're buying your own products right?

That's right.

- What are the important barriers to improve nutrition quality?

Cost. That's one of the most important. If marketing can't see a significant gain in market share or they can't see a significant gain in cost, in terms of better bottom line, then they will not put it through.

- What do you read the nutrition labels for?

Personally I look at them to see if there are any animal products. I don't really read them to see what the fat level is, I read them mainly for the ingredient list. That's the one that is most important to me. I do not want to be consuming any animal products.

- Which product do you read the labels?

I read the label of every product.

- How do you use the label?

I look at it and... I'll try everything once. If I pick up something at the supermarket and I think 'oh yeah let me try this' I'll pick it up because maybe it's attractive or look at the label and something new, or it's something I'd like to try; may be a brand like for example a brand of tofu I haven't eaten it yet so I pick it up and think I can try this. Then I look at the back look at the ingredients to see if there's any animal products like if there's gelatin inside I just put it straight back I wouldn't even take it. If it has no animal products then I'll buy it. I don't even compare with anything else that's not a factor to me. I only do it once and if I don't like the taste I won't buy it again. If I like the taste then I'll look at the cost to see if it's viable for me to buy it as an ongoing product. That's how I do my shopping.

- How do other people choose general products based on?

I would think value for money. There would be probably 10% of the population that looks for something specific in terms of like calcium properties. Then I would say there's another 10 or 15% that looks at specifically for something that's got allergens in it which they can't have. And I would probably think I'm part of that category where I look for something and say 'I can't buy this'.

- How do other people choose your products based on?

There are 2 main categories in terms of buying margarine. You know you buy fat so some people buy it because it's cheap and they have to spread something on their bread. Others buy them because they want to eat it but they don't want all the baddies of having too much fat.

We've seen a survey done by some of our marketing people where people eating butter have moved to the total opposite side of the scale and went and bought like 'Oliviani' margarine. So they moved away from butter because of, you know it's got excellent taste, margarine has not such good taste, but they are willing to compromise the taste of it to have something that's really healthy. So that's where we find the shift is and that will only happen probably after they visit a doctor and the doctor says 'your cholesterol is very high, if you don't do something you're going to die.'

- Does the new label regulation force you to change your product formulation?

No. Our products here are generally all compliant with all food codes, the only thing we needed to do was give more information on ingredients.

- Under the new regulation, people can now compare the amount of nutrients or additives in every product, do you think this will make a difference to your consumers?

No. This is nice information to have but at the end of the day if you like the taste of a product it doesn't really bug you whether this one got 200 grams or 200 calories more than your competitor. They would rather buy the 200 calories more because they like the taste. So, I don't think it plays a very important part. It's good information to have though.

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