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Attitudes and intentions towards purchasing food produced using genetic engineering:
Modelling and understanding the motivations for purchasing behaviour

A thesis
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by
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Attitudes and intentions towards purchasing food produced using genetic engineering: Modelling and understanding the motivations for purchasing behaviour

by A. J. Cook

This thesis identifies the nature, strength and relative importance of influences on intentions regarding the purchase of food produced using genetic engineering. Drawing upon contemporary attitude-behaviour research, a model is developed of the personal motivations towards the purchase of these foods. The model is a modification of the Theory of Planned Behaviour (Ajzen, 1991) with self-identity as an additional determinant of intention. Also included in the model were a number of factors that were hypothesised as having relationships with the determinant components of the model, including prior purchasing based on concern for the environment or concern for personal health. The model was initially tested using focus groups and survey questions were developed. The survey utilised a categorical measure of intention, which is a variation on the cardinal measure of intention traditionally used in attitude-behaviour research. In addition, the survey employed a variation on the formation of attitude, with attitude towards outcomes from the use of the technology being identified and subsequently incorporated in the formulation of attitude towards the performance of the behaviour. Analysis of the survey sample (N = 266) was undertaken using ordered logit modelling which enabled the simultaneous examination of five categories of intention. The results supported the model. Key findings were that self-identity, attitude, subjective norm and perceived behavioural control had both combined significance and independent significance in determining the categories of intention. In addition, these determinants were distinguished in terms of their relationships with age, gender, prior behaviour, and the believability of information sources. The results provided direction for the application of attitude-behaviour modelling to this topic area. In addition, the efficacy of using a categorical measurement of intention and utilisation of ordered logit modelling for attitude-behaviour research was demonstrated. The use of attitudes
towards a target object, within the commonly utilised attitude towards behaviour formulation, was also identified as an important theoretical development. In addition, similarities between the expectancy value formulations of attitude used in the study and risk assessment indicate that factors identified in risk perception studies may well have a bearing on attitude. Expected changes in intention given the nature of its determinants are identified and consideration is given to the tactics of proponents and opponents of the technology given the findings of this study.

Key Words: attitude, self-identity, intention, purchase, genetic engineering, food.
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Chapter one
Introduction

1.1 Introduction

Foods produced using genetic engineering are currently available for purchase in New Zealand. Some of these foods are produced locally, including food additives, such as flavouring agents and sweeteners, and products from farm animals that have been treated with hormones and vaccines produced using genetic engineering. In addition, a number of foods contain ingredients that have been produced overseas using genetic engineering. At present there is no requirement to inform the public as to whether genetic engineering has been used in the production of a food. In consequence, the acceptability of these foods by the public cannot be accurately gauged from their sales records. Studies of attitudes in New Zealand to the use of genetic engineering in food production indicate that this use of the technology is generally considered to be acceptable. However, these studies, while useful for providing an indication of public attitudes, have not sought to determine whether or not people will purchase these foods or sought to determine the reasons for these purchase decisions.

This research reveals intentions towards purchasing food produced using genetic engineering\(^1\). In addition, an understanding of these intentions is derived from the identification of influences on the formation of intention. Extending from these findings, predictions are made of the dynamics of intention given a change in these influences. The research utilises and tests the Theory of Planned Behaviour (TPB) (Ajzen, 1991), which is designed for the prediction and understanding of human behaviour. The theory is adapted to meet the objectives of this research and an additional variable, a measure of self-identity, is proposed as having an independent effect on intention. The theory is applied according to the recommendations of Ajzen and Fishbein (1980), to ensure that previous research supports the findings of this research.

\(^1\) In this research food produced using genetic engineering includes genetically modified food and food which has been produced using the technology which may contain no genetically modified material. This approach is taken to include reactions to the use of the technology, as well as reactions to products that contain modified material.
In keeping with the axioms of the TPB, the purchase of food produced using genetic engineering is considered to be subject to the intention of the individual. Intention is held to be primarily determined by an attitude towards the performance of this behaviour. The research is concerned with the attitudes, intentions of the public, and recognises that public knowledge of the technology may be limited and that the public may have difficulties in identifying whether or not a food has been produced using genetic engineering. These factors are accounted for in this research, which seeks to determine attitudes and intentions given the current conditions and circumstances encountered in everyday life.

This introductory chapter is intended to provide background for this study by further defining the topic and providing a review of previous studies of attitudes of relevance to this thesis. The chapter closes with presentation of the aims and objectives of this thesis and an overview is provided of the remaining chapters.

1.2 The process of genetic engineering

Genetic engineering is employed to enable food to be produced more efficiently. The process involves using molecular genetic methods to alter the genetic composition of cells and organisms by manipulating recombinant DNA (deoxyribonucleic acid) (Macer, Bazar & Gough, 1991). DNA contains genetic information that determines the characteristics and traits of a microorganism, plant or animal, which are passed on to subsequent generations. Genetic engineering can be used to introduce foreign DNA into a host cell, which can then produce offspring that exhibit the traits of the foreign DNA (Mannion, 1992). The technology has been used in the production of a variety of foods and a number of microorganisms, plants and animals are currently being researched for their potential for improvement by genetic modification.

In agriculture, genetic engineering research has focused on improving nutrient absorption, enhancing photosynthesis and modifying microorganisms to assist in nitrogen fixation. In addition, methods to enhance resistance to insects and disease, pesticides, herbicides and tolerance to adverse weather conditions are being developed
(Conner, 1997). Microorganisms have been genetically modified to enable fermented food, such as cheese or wine, to be produced more efficiently. The genetic modification of farm animals has produced animals that gain weight faster and produce leaner meats than non-modified animals. In some cases virus resistance has been instilled and in others, animals have been genetically modified to express human hormones in their milk.

Genetically modified microorganisms, plants and animals may be used directly as foods or as food supplements. Genetically modified organisms have been used in the production of enzymes, amino acids, vitamins, sucrose, and starch. Genetically modified microorganisms have also been used in the production of vaccines, hormones and antibiotics for the treatment of farm animals (Tueber, 1996).

1.3 Attitudes to the use of genetic engineering in food production

In this thesis attitudes towards purchasing food produced using genetic engineering are expected to have a substantial influence on intentions to purchase food produced using genetic engineering. A number of studies have been conducted of attitudes towards genetic engineering that can be drawn upon for this research. These studies may, however, not be directly relevant to this research, which focuses on the determining attitudes and intentions to purchasing food produced using genetic engineering.

Over the past nine years there have been several studies conducted in New Zealand that have sought to gauge the acceptability of genetic engineering. The first, undertaken by means of face-to-face interviews, examined the attitudes of 2,034 adults to the genetic manipulation of a number of different organisms (Couchman & Fink-Jensen, 1990). The survey found that 74% of respondents were aware of genetic engineering as a technology, of which 57% thought research in this area was beneficial. The acceptability of the genetic engineering of plants (85.5%) and animals (56.6%) was higher than that of manipulating human cells (42.5%).
A mail survey was conducted by Macer (1994) which drew a sample of 329. The survey found that 56% of respondents indicated that genetic engineering of plants was acceptable and that 29% considered the genetic engineering of animals to be acceptable. The 80% of respondents who were aware of the use of the technology to produce food were asked their level of concern in relation to types of food products. Genetic manipulation of meat was of most concern, followed by dairy products and vegetables, which drew the least amount of concern. Respondents also reported the reasons for their choice of level of concern. The most common reason against genetic modification was that the foods were considered to be unnatural (20%) and 11% reported the concern that safety measures were inadequate.

A further relevant study was conducted by means of telephone interviews that focused on gauging public opinion of the use of genetic engineering as a method of biological control (Fitzgerald, Saunders & Wilkinson, 1996). Of the 1,017 respondents, 89.5% expressed familiarity with the potential of the technology to increase the quality or quantity of agricultural products. In a measure of the acceptability of the use of genetic engineering in agriculture 14% found it unacceptable, 18% reported indifference and 65% reported approval.

A more recent survey, conducted as part of an international study, was undertaken by means of a telephone survey (Macer, 1998). Of the 508 respondents, 69% expressed approval for the use of genetic engineering in the production of food and drinks. The respondents were also found to have a relatively better understanding of genetic engineering than people in most other countries including Japan, Canada and the European Union. Sixty-six percent of respondents considered that the genetic engineering of crop plants for resistance to pests should be encouraged.

Relevant attitude research conducted overseas has employed a variety of research techniques. In 1987 the US Office of Technological Assessment (OTA) concluded from a telephone survey that "...while the majority of the public expresses concern about genetic engineering in abstract, it approves nearly every environmental or therapeutic application" (OTA, 1987:5 cited in Norton, 1998:175). Focus groups conducted in New
Jersey between 1992 and 1995 found that attitudes were fairly positive towards the use of genetic engineering in agriculture and to its products. The favourability of these attitudes were related to the level of knowledge about the technology, an awareness of its potential benefits, confidence in regulatory authorities and trust of information sources (Hoban, 1996). Focus group research conducted over a number of US states found that while most participants approved of the technology, they still sought assurances that food produced using genetic engineering was safe and requested that more information be made available about the technology (Zimmerman, Kendall, Stone & Hoban, 1994). This research also found that respondents had only moderate trust in the statements made by government agencies and held reservations about the ability of these agencies to ensure adequate safety standards.

In the UK concern about the possibility of health and environmental risks are noted as a prominent influence on attitudes. This concern has been found to be related to the welfare of others, future generations and the environment, rather than to the welfare of the respondents themselves (Frewer, Howard & Shepherd, 1996). Interpretation of the Eurobarometer, a longitudinal survey of European attitudes towards genetic engineering, has found that public acceptance has decreased over time, while awareness of the technology has increased (Jank, 1995). Investigations of the attitudes of interested subgroups within society has found that strong proponents and opponents of the technology have attitudes that are difficult to change (Martin & Tait, 1992). People within these groups were also more likely to seek information to reinforce their existing attitudes, whereas groups with less polarised attitudes were more open to a wider range of information sources.

Differences in consumer acceptance of the technology between countries has been attributed to differences in culture and history, economic conditions and government response to the issues related to the introduction and development of the technology (Hoban, 1997). It is therefore expected that attitudes in New Zealand will be different from those in other countries. Research conducted overseas and in New Zealand indicates that there are mixed attitudes about the use of genetic engineering in food production. In addition, a variety of conclusions have been reached about the influences
on these attitudes. It is also evident that attitudes change over time and vary depending upon where the respondents live. These factors indicate that for an accurate assessment of attitudes to be made, fresh local research is an imperative.

1.4 Thesis statement, aims and objectives

My thesis is that the identification of the nature, strength and relative importance of influences on intentions towards purchasing food produced using genetic engineering, provides a detailed explanation of intentions regarding the performance or non-performance of this behaviour.

The overall aim of this thesis is therefore to understand the personal motivations that determine whether or not foods produced using genetic engineering are purchased. Primary objectives related to achieving this overall aim, are (i) to determine the extent to which people intend to purchase or intend not to purchase these foods, and (ii) to identify the influences on intentions to purchase or not purchase these foods. In addition, a projection is made of changes in intention given a change in attitude or other influences identified in the study.

It is hypothesised that attitudes towards the behaviour of purchasing of food produced using genetic engineering are a prominent influence on intentions to purchase or not purchase food produced using genetic engineering. Further objectives that are necessary for testing this hypothesis and achieving the overall and primary objectives are:

- To review relevant research on the attitude-behaviour relationship, towards the development of an appropriate conceptual model and for the development of appropriate research methods for this thesis.
- To gather and analyse information about requisite attitudes and intentions and influences upon these attitudes and intentions.
- To evaluate the effectiveness of the conceptual model and the methods employed.
- To draw theoretical and practical implications from the study.
• To form recommendations for further studies using attitude-behaviour modelling and further studies of attitudes and intentions to purchase food produced using genetic engineering.

• To speculate on changes in attitudes and intentions, given the identification of important influences on current attitudes and intentions.

1.5 Thesis structure

The following is a brief overview of the remaining chapters of this thesis.

Chapter two is a review and evaluation of current research of the attitude-behaviour relationship. The findings of this review are used to develop a conceptual model of the motivations towards purchasing food produced using genetic engineering. The chapter concludes with the presentation of the model of motivations to purchase food produced using genetic engineering and the presentation of the key hypotheses of the model.

Chapter three describes the results of three focus groups that were facilitated to determine attitudes and other influences on intentions regarding the purchase of food produced using genetic engineering. Thoughts, ideas, attitudes and concerns related to the intentions of focus group respondents are presented. The chapter concludes with the refinement and finalisation of the conceptual model.

Chapter four draws on the results of the focus groups and details the construction of a quantitative survey to determine the attitudes and intentions of the wider population.

Chapter five presents the survey findings and their analysis. Current intentions are determined and prominent influences on these intentions are identified. The hypotheses established in chapter two are evaluated and a number of additional relationships of importance to meeting the aims and objectives of this thesis are also identified.

Chapter six is the concluding chapter of this thesis. The chapter begins with a discussion of the survey findings. The findings are drawn upon to form theoretical implications.
Practical implications are then identified, with consideration of prospects for changes in attitudes and intentions from various influences, including labelling of the food and the possible intervention tactics of proponents and opponents of the technology are considered. The chapter closes with a summary of the conclusions and recommendations of this thesis.
Chapter two
The attitude-behaviour relationship

2.1 Introduction

Within social psychology a good deal of research has been undertaken towards understanding the relationship between attitudes and behaviour. This research has concentrated on determining an individual’s motivations for his or her behaviour, when presented with a free choice over whether or not he or she should perform a behaviour. This choice is held to be primarily determined by an individual’s attitude, which is interpreted as a predisposition towards the performance of a behaviour. Discerning the nature of attitudes and accounting for influences upon these attitudes is held to determine the reasons for the behaviour.

This chapter is a review of research regarding the attitude-behaviour relationship. The review is undertaken to explain the theoretical approach taken in this thesis and to provide background for the development of a conceptual model of the motivations for purchasing food produced using genetic engineering. The review begins with a discussion of the attitude concept as it is used in contemporary attitude-behaviour research. The review concentrates on the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980), which is arguably the most successful conceptual model of the attitude-behaviour relationship. Criticism of the theory is noted and a number of proposed improvements to this theory, in the form of additional variables, are presented. Drawing from this review, a model of the motivations to purchasing food produced using genetic engineering is developed and the model’s key hypotheses are stated.

2.2 The attitude concept

"Attitudes determine for each individual what he will see and hear, what he will think and do" (Allport, 1935:806). This observation of the role of attitudes set the scene for subsequent attitude research. The predominant view that developed subsequently
considered attitudes to be functional for the individual, as they guide perceptions, cognitive processes and behaviour (Farr, 1996).

Attitude research has also been shaped by the predominant approach of cognitive science. This approach focuses on uncovering internal thought processes, that are considered to be given expression in a person's behaviour and responses (Farr, 1996). Modern definitions incorporate the cognitive approach and generally assume that an attitude is an internal disposition toward someone or something that incorporates an evaluative process (Ajzen, 1989). An attitude is also considered to be an evaluative reaction that is revealed through thoughts, feelings and behaviour (Eagly and Chaiken, 1993). These three components, cognition, affect and behaviour, are thought to be closely related, as a change in one of them usually influences the others and affects the overall attitude. The three components are held to represent different forms of attitude, though strong interrelationships between these components can also be used to justify their consideration as parts of a single structure (Ajzen, 1989). Such a structure is a type of hypothetical construct that is inaccessible to direct observation, with its nature established through determination of a person's evaluations regarding someone or something.

2.3 The attitude-behaviour relationship

The cognitive view of attitudes has been a central concept in the study of the links between attitudes and behaviour. Attitudes are held to be a major determinant of an individual's behaviour and of his or her thoughts and perceptions of the world. The importance of attitudes as a means of predicting and understanding behaviour has, however, been challenged. Early research by LaPiere (1934) questioned the usefulness of attitudes for predicting behaviour. A critique by Festinger (1964) observed that little support had been provided for the common hypothesis that a change in attitude would produce a corresponding change in behaviour. Subsequently, Wicker (1969) found, in a review of a number of studies, that only a weak relationship existed between attitudes and behaviour. In response to these criticisms, various researchers have focused on re-establishing attitudes as an important determinant of behaviour.
Arguably the most successful development in the study of the attitude-behaviour relationship is the TRA (Ajzen and Fishbein, 1980). This theory is based on the view that people make rational decisions regarding their behaviour to satisfy their personal interests. The theory has improved correlations between attitudes and behaviour in two main ways. First, attitudes that apply specifically to the performance of a particular behaviour are targeted. Second, the measurement of another variable, a subjective norm, that also influences behaviour, is also included.

The TRA has been found to be a successful model of the attitude-behaviour relationship (e.g. Sheppard, Hartwick & Warshaw, 1988). The theory has also received criticism, particularly for claims that the model is applicable to a wide range of behaviours (Eagly & Chaiken, 1993). In response, researchers such as Eagly and Chaiken (1993) recommend the use of additional variables, when they can be argued to be of relevance to the study of attitudes towards a particular behaviour.

A further development is the study of learning processes that relate to attitudes and behaviour. Research by Fazio and his colleagues, (summarised by Fazio, 1986), has found that attitudes differ in strength and functionality depending on how they are formed. In particular, prior experience and repeated elaborations of that experience have been found to produce attitudes that are more readily brought to mind and also more consistent over time. These differences were pronounced in studies of the ease of accessibility of attitudes from memory, which were designed to identify the learning processes associated with the formation of attitudes.

2.4 The Theory of Reasoned Action

The TRA (Ajzen and Fishbein, 1980) is a model of the relationship between attitudes towards undertaking a behaviour and the act of undertaking a behaviour. As illustrated in Figure 1, attitudes are posed as a determinant of behaviour through their effect on a person's intentions to undertake a behaviour. Intentions are also considered to be subject to motivations to comply with perceived social pressures from people whose opinion is important to the individual. A central concept is that attitudes are formed from beliefs
regarding the consequences for the individual of performing a behaviour. These attitudinal beliefs are held to be subject to pressure from normative beliefs that one should conform to the views of one’s peers. Attitudinal and normative beliefs are considered to form an intention to perform a behaviour, which is expected to be highly correspondent with the actual performance of a behaviour. Application of the model is restricted to behaviours that are undertaken voluntarily, as these are presumably only dependent on whether or not a person intends to perform them.

The person's beliefs that the behavior leads to certain outcomes and his evaluations of these outcomes

The person's beliefs that specific individuals or groups think he should or should not perform the behavior and his motivation to comply with the specific referents

Attitude toward the behavior

Relative importance of attitudinal and normative considerations

Intention

Behavior

Subjective norm

Figure 1. Factors determining a person's behaviour (Ajzen and Fishbein, 1980:8)

The relationship between the determinants in the formation of intention is a linear function of attitude toward the behaviour and subjective norm, which can be expressed algebraically as:

\[ B = BI = w_1 AB + w_2 SN \]
In which B is the behaviour, BI is behavioural intention, AB is the attitude toward the behaviour and SN is the subjective norm, w1 and w2 are weights indicating the relative importance of AB and SN.

2.4.1 Intention

The TRA poses intention as the immediate determinant of behaviour. Intention represents a person's motivation to carry out a behaviour, which is formed through premeditation. Habitual, spontaneous or impulsive behaviours are therefore not addressed, as intentions take little or no immediate role in determining a choice of action that does not involve prior consideration. A change in intention is expected to produce a corresponding change in behaviour. Failure to find correspondence between intention and behaviour is attributed to an intervention that prevents intention from determining behaviour. Insufficient time, resources and personal ability are factors that may intervene between an intention to undertake a behaviour and the act of undertaking the behaviour.

Intention is formed wholly from two determinants, attitude toward the behaviour and subjective norm. An intention can be either positive or negative, as it is derived from the sum of the two relatively weighted determinants, which may themselves have either a positive or negative value. Ajzen and Fishbein (1980) consider intentions to be an accurate predictor of behaviour when sought with reference to a specific behaviour.

2.4.2 Attitude toward the behaviour

Attitude toward the behaviour is defined as the sum of the salient beliefs associated with the performance of a behaviour. Salient beliefs are beliefs about the consequences, which are of importance to the individual, of him or her performing the behaviour. To form attitude towards the behaviour, an evaluation is made of how good or bad each consequence will be. This evaluation is then multiplied by an expected value, which is an estimation of the likelihood of the consequence occurring. Attitude toward a behaviour is then derived from the sum of the value of all the important consequences of performing the behaviour, subject to an estimate of their expected value. Attitude toward the behaviour can be represented algebraically as:
\[ \text{AB} = \sum_{i=1}^{n} b_i e_i \]

Attitude towards the behaviour (AB) is therefore formed from a sum of the value of salient beliefs about the consequences of performing the behaviour \((b)\) when multiplied by their expected value \((e)\).

### 2.4.3 Subjective norm

The subjective norm is a function of salient beliefs concerning the opinion of important others regarding the individual performing a behaviour. These beliefs, termed normative beliefs, are formed from beliefs about what other people, of importance to the individual, think of the individual performing the behaviour. The subjective norm is formed by measuring how favourable or unfavourable important others are of the individual performing the behaviour when multiplied by the individual’s motivation to comply with the views of others. Motivation to comply encompasses perceived pressure to adhere to another person’s opinion, due to the nature of their opinion, and pressure to conform to the opinion of the person, due to their perceived status. Subjective norm can be represented algebraically as

\[ \text{SN} = \sum_{i=1}^{n} nbi mci \]

Subjective norm (SN) is therefore formed from the sum of all normative beliefs about how favourable or unfavourable important others are of the individual performing the behaviour \((nb)\) when multiplied by the motivation to comply \((mc)\).

### 2.4.4 Beliefs as mediators of external variables

The TRA is built upon the view that intentions are wholly formed from attitudinal beliefs and normative beliefs. Ajzen and Fishbein (1980) class other possible variables that could affect intentions, such as attitudes towards people or institutions and personality traits, as external variables. External variables are held to have only an indirect effect on intention, through their influence on beliefs. Beliefs are therefore presented as immediate determinants of intention that mediate the influence of external
variables on intention. On these grounds, Ajzen and Fishbein (1980) claim that their model can then be applied to a variety of behaviours, unhindered by the need to consider specific independent variables that may only pertain to the performance of a particular behaviour.

2.4.5 Applications of the TRA

The TRA has been applied to the study of a wide range of behaviours. Ajzen and Fishbein (1980) included drug and alcohol use, voting, contraceptive use, breast feeding and consumer behaviour, as examples of behaviours that were well predicted through use of the model. A comprehensive review by Sheppard et al., (1988) found that, in their examination of 87 cases, the model produced an average correlation of .66 between beliefs and intention and an average correlation of .53 between intention and behaviour. The review included studies of blood donation, exercise, leisure activities, food consumption and criminal acts.

2.5 Variations to the Theory of Reasoned Action

The TRA has been recognised as an effective means of predicting behaviour from attitudes. The theory has also received criticism, particularly for its claim that all variables of relevance are taken into account (Eagly and Chaiken, 1993). Many of these criticisms have led to the development of variations in the form of additional variables that are promoted as improvements to the model. These proposed variations relate to some behaviours more than others and challenge the generalised way in which the TRA has been applied. The value of using a variation is therefore subject to its relevance to a particular type of behaviour and should be considered accordingly.

2.5.1 Behaviours that require resources, cooperation and skills

In a critical examination of the causal structure of the TRA, Liska (1984) argued that skills, abilities and the cooperation of others are important influences on the performance of a behaviour that are omitted from the TRA. This argument is based on the consideration that people are frequently unable to behave as they intend, due to a
lack of resources or opportunities. Behaviours that lack these enabling factors are not addressed by the TRA, because Ajzen and Fishbein (1980) class them as non-volitional and beyond the scope of their model. This restriction limits the TRA to behaviours that are volitional\(^2\), which are predicted more easily from a measure of intention. Liska (1984) claimed that many behaviours require some means to accomplish them and argued for adjustments to the TRA to include their consideration. On the grounds that the requisite distinction between volitional and non-volitional behaviour is unnecessary, Liska (1984) suggests a modification in the determination of behaviour to account for the proportionate influence of intention and factors such as personal ability and the cooperation of others.

The TRA does not include resources and opportunities as immediate determinants of behaviour, but consideration of these factors can be found in the formation of intention. Ajzen and Fishbein (1980) stress that for the accurate prediction of a behaviour, the measure of intention should be made immediately prior to the performance of the behaviour. This is expected to improve the correspondence between intention and behaviour, as intention will be formed with reference to the conditions that affect intention and behaviour at that time. Ajzen and Fishbein’s (1980) recommendation would then improve the prediction of behaviour, but conversely it is also a constraint, because accurate predictions are more likely to be derived from studies of imminent behaviours.

A problem may, however, occur when behaviours require resources and previous experience of the behaviour is lacking. If a person is unable to estimate their skills or personal abilities, then they would be hindered in making an accurate evaluation of their prospective behaviour. Ajzen and Fishbein (1980) recognise that a lack of experience may contribute to an intention being inconsistent with performance of the behaviour. This lack of knowledge of the skills required is assumed to improve with performance of the behaviour. The more often a behaviour is performed, the easier a person can gauge their skills and abilities to perform it. Therefore, intentions measured after the

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\(^2\) In the context of attitude-behaviour research, "volitional" refers to performance of the behaviour being subject to the free will of an individual.
performance of the behaviour would also facilitate a more accurate prediction of subsequent behaviour.

2.5.2 Past behaviour
Through tests of the assumptions of the TRA, Bentler and Speckart (1979) found that including the effects of past behaviour and habit, improved the understanding and prediction of behaviour. They observed that people have a tendency to behave as they had in the past and concluded that past behaviour had an independent influence on attitude, subjective norm, intention and behaviour.

Ajzen and Fishbein (1980) exclude habitual behaviour from their model, as they adjudge it unlikely to contain an intention. Bentler and Speckart (1979) include consideration of the effect of habit directly on behaviour, as they recognise that past behaviour can be habitual. As shown in Figure 2, past behaviour is also held to be associated with attitude and subjective norm, which is not inconsistent with the TRA, which considers many external factors to be influential in this manner. A notable contrast can be found in the consideration of past behaviour as a separate determinant of intention, and in the assertion that attitude has a direct effect on behaviour, exclusive of intention.

![Figure 2. The role of past behaviour (Adapted from Bentler & Speckart, 1979)](image-url)
The proposal that past behaviour be considered a separate variable is based on the view that, if prominent, its effect on intention would only be partially related through attitude and subjective norm. More significantly, importance is given to past behaviour due to its prominence in behaviourism as a predictor of future behaviour. When tested by Bentler and Speckart (1979), evidence was found to verify this supposition, supporting the establishment of past behaviour as an independent variable. The model does, however, contain an unresolved conflict as repeated behaviour presumably reinforces a person's intention, but repeated behaviour can also cause the behaviour to become a habit, which does not incorporate an intention. This conflict can be resolved by considering habitual behaviour as a behaviour in which intentions are not activated so that, if a person was prompted, presumably they would form an intention and habit would then act as past behaviour in the model (Ronis, Yates & Kirsch, 1989).

Bentler and Speckart's (1979) proposal that attitude has a direct link to behaviour is based on the view that an attitude need not necessarily be consciously considered to affect behaviour. Their tests verified this stance, but in a subsequent similar study Fredricks and Dosset (1983) found no significant evidence for a direct path between attitude and behaviour. Bagozzi, Baumgartner and Yi (1989) have subsequently clarified these differences with their finding that attitude directly influences behaviour, when little or no thought is employed in consideration of the behaviour. This is similar to the view that as habitual behaviour does not provide the opportunity for conscious consideration, an intention will not be formed. A notable difference is, however, found in the consideration that an attitude may be present, but no process of conscious reasoning is found to occur. The effect of attitude on behaviour can then be assumed to occur directly, without the mediating effect of intention. This observation is reinforced by Bagozzi and Yi (1989), who identified that attitudes would have a direct effect on behaviour when intentions are poorly formed. Intentions, when they were well formed, were expected to completely mediate the effects of attitudes on behaviour.
2.5.3 The Triandis model

The Triandis attitude-behaviour model (Triandis, 1980) is comparable to the TRA, as both models use an intention, formed from attitudinal beliefs and subjective norms, to determine behaviour. The Triandis model is, however, more complex, due to the inclusion of a wider range of variables to determine intention. This complexity is further compounded with additional variables, other than intention, used to determine behaviour. Additional variables that determine intention include a personal norm, a measure of self-identity in the form of role beliefs and affect toward the behaviour. Intention remains a determinant of behaviour and is complimented by past behaviour, facilitating conditions and arousal, which includes personal motivations that favour the performance of the behaviour. In application, the Triandis model does not consistently improve on the TRA in the prediction of behaviour (Eagly and Chaiken, 1993). The Triandis model has, however, been useful in understanding repeated behaviours that are encountered in public health studies. In this respect the Triandis model challenges the effectiveness of the TRA for some behaviours and potentially provides a more complete explanation of the influences on intentions and behaviour.

2.5.4 The Theory of Planned Behaviour

The TPB (Ajzen, 1991) is a modification of TRA that is designed to include the consideration of behaviours that are not entirely subject to volitional control. The theory, depicted in Figure 3, introduces an additional variable termed perceived behavioural control (PBC), which is a measure of a person’s perceived ability to perform a behaviour. This measure of perceived ability is intended to incorporate a person’s consideration of resources and opportunities that are recognised as conditional for the performance of some behaviours. This addition brings a new approach to the formation of intention that is not included in the TRA. The more recent TPB emphasises the activity of planning, as the motivation to perform a behaviour is supplemented with a consideration of the means that are necessary for its performance.

PBC represents perceived ability in a measure of the degree of control a person considers he or she has over his or her performance of the behaviour. The need for skills and abilities, or resources and the cooperation of others is recognised by the individual
and the perception of his or her ability to meet these needs is held to affect the individual’s intention. PBC thus represents a person’s perception of how easy or difficult it is to perform the behaviour when multiplied by the perception of the degree of power he or she has over the performance of the behaviour. Perceived behavioural control can be represented algebraically as:

\[ PBC = \sum_{i=1}^{n} c_i p_i \]

Representing PBC as being formed from the sum of the perceived ease or difficulty of all control beliefs \( c \), when they are multiplied by the perceived power \( p \) that each belief has over performance of the behaviour given the personal abilities of the individual.

Figure 3. The Theory of Planned Behaviour (Ajzen, 1991:182)

PBC is expected to interact with the components of the TRA in a number of ways. As depicted in Figure 3, PBC is expected to affect behaviour primarily through its effect on intention and possibly through having a direct effect on behaviour. Once an intention is formed a person’s level of confidence may influence their performance of the behaviour,
as when a person’s doubts about his or her own ability may prevent him or her from behaving as he or she intends. Confidence in a person’s performance underlies their perceptions of control and could be construed in terms of having a mediating effect between intention and behaviour. PBC may also be found to affect the relationship between intentions and behaviour when an accurate depiction of the resources and opportunities associated with the behaviour is made, so that perceptual impressions equate with actual conditions. PBC could then be related to conditions that directly affect behaviour, as well as measuring the influence of these conditions on intentions to perform the behaviour.

The TPB has been applied to the study of a variety of behaviours. Ajzen (1991) reviewed a range of these including voting, playing a video game, losing weight, shoplifting and cheating in an exam. Examples of more recent studies of intentions and behaviour that relate to this thesis are of the purchase of organic food (Sparks & Shepherd, 1992), newspaper recycling (Boldero, 1995; Cheung, Chan & Wong, 1999), home composting (Taylor & Todd, 1995) and expectations regarding the acceptability of using genetic engineering in food production (Sparks, Shepherd & Frewer, 1995).

In addition to considering the improvements to the prediction of behaviour, Ajzen (1991) also examined whether PBC mediated the effects of past behaviour on intention. Ajzen (1991) conceded that the TRA did not sufficiently account for the effect of past behaviour on intention, as claimed by Bentler and Speckart (1979). Based on the view that past behaviour is an important influence on a person’s perceived ability to perform a behaviour, PBC is proposed as an important mediator of the effects of past behaviour on intention. Using the data from three earlier studies, Ajzen (1991) tested the proposal and found that variations in PBC reflected the effects of past behaviour on later behaviour, indicating that PBC may mediate the effects of past behaviour on intention.

The TPB is promoted as an improvement to the TRA, due to its provision for dealing with behaviours that are not entirely volitional. A further advantage in using the TPB is that when PBC is found to be non-significant, the remaining variables, which constitute the more tested TRA, may be utilised to predict behaviour. PBC can be non-significant
when the behaviour is volitional and little or no degree of personal control is perceived to be needed for its performance. In addition, problems that require PBC may be ameliorated to the extent that they have no effect on intention. Some people may consider that they have the means to overcome difficulties that could prevent him or her performing a behaviour. This would reduce the power of any control beliefs so that they would have little effect on intention.

The TPB challenges the assertion by Ajzen and Fishbein (1980) that the TRA sufficiently accounts for all relevant variables that form an intention. Ajzen (1991), in promoting the extension to the TRA, suggested that the theory is amenable to the addition of further predictor variables "...if they could be shown to capture a significant portion of the variance in intention or behaviour after the theory's current variables had been taken into account" (Ajzen, 1991:199). This statement was backed by findings from Beck and Ajzen's (1991) study of cheating, lying and shoplifting, which revealed that their prediction was enhanced by the addition of a measure of perceived moral obligation as an independent variable in the formation of intention. Arguments for the addition of variables such as personal morals, self identity and affective responses to the TRA and the TPB are therefore condoned by Ajzen (1991) as long as a significant proportion of the variance is captured.

2.5.5 Personal morals
Research suggests that for some behaviours a separate measure of personal morals, the subjective assessment of right and wrong, is warranted. Schwartz and Tessler (1972) found that personal normative beliefs, which were defined as personal beliefs about whether the behaviour should or should not be performed, differed from social normative beliefs. Their study of organ donation found that personal normative beliefs had a stronger effect on intentions than social normative beliefs. Zukerman and Reis (1978), similarly found an independent effect for personal morals in the study of blood donation when combined with attitudes and social norms. Gorsuch and Ortberg (1983) present further evidence in a study that included consideration of whether people would return a tax refund overpayment, or work on a Sunday rather than attend church. Their
view was that personal morals did not incorporate utilitarian factors and that to obey a personal moral was to respect it as something important in itself.

Personal morals are considered to invoke a sense of duty to adhere to a personal standard of behaviour, which may contrast with personal interests in the performance of a behaviour (Biddle, Bank & Slavings, 1987). This observation has not been challenged in the literature, but the question of how moral rules affect attitudes and intentions has been debated. Ajzen and Fishbein (1980) assume that moral rules are adequately accounted for in their measure of a social norm. Biddle et al. (1987) agree and observe that while a person's own morals are distinguishable from others, personal morals do not develop in isolation and are likely to reflect those of others. More recently, however, Ajzen himself (Beck & Ajzen, 1991) found an independent effect for perceived moral obligation, which incorporates beliefs about right and wrong. Parker, Manstead and Stradling (1995) also studied perceived moral obligation. In their modification of Beck and Ajzen's (1991) design they considered that perceived moral obligation was best measured as a level of anticipated regret that arises when acting in conflict with personal morals. In testing this proposal with respect to reckless driving, perceived moral obligation was found to have a significant independent effect on intention. This finding indicated that a separate measure of personal morals was warranted, because its effect on intention was not adequately translated through attitudinal beliefs or the subjective norm. Therefore, the incorporation of personally held notions of right and wrong, as a separate variable in determining intention, is a consideration for behaviours that are likely to challenge them.

2.5.6 Self-identity
Self-identity is generally interpreted as a label that people use to describe themselves. It is assumed to be the product of social interaction and the cause of subsequent behaviour (Biddle et al., 1987). A number of tests have been made of the effects of self-identity on behaviour in comparison with the components of the TRA. Charnig, Piliavin and Callero (1988) found that in a study of blood donation, people associated their performance of the behaviour with their sense of self-identity. They also found that an independent measure of self-identity improved predictions of intentions and behaviour. A further
notable finding was that self-identity became relatively more significant when the
behaviour was repeated, whereas the other variables of attitude toward the behaviour
and subjective norm became comparatively less significant. Charng et al. (1988)
concluded that repetition of the behaviour led to the behaviour becoming more
integrated within a person's self-identity. They also concluded that the weakening of the
effects of the other variables was due to the behaviour becoming more habitual and less
subject to intentions, as envisaged by Ajzen and Fishbein (1980). Biddle et al. (1987)
found that students' intentions to remain at college were influenced by their self-
identity. College students were found to focus on the outcomes of their studies as
incentives to remain in college, while also being subject to perceived social pressure to
remain in college. For some students, however, their self-identity was in opposition to
these considerations because they felt that they were not the type of person suited to
being a student.

2.5.7 Attitudes as evaluations of an attitude object.
The TRA utilises attitudinal beliefs as a measure of attitude. The approach, while
generally accepted as successful in predicting behaviour, does not necessarily improve
the understanding of attitude formation. Attitudinal beliefs have been used to measure
attitudes, but little attention is given to how attitudes are formed. In promoting an
alternative model of the relationship between attitudes and behaviour, Fazio (1986)
considers attitudes to be learned associations between an object and a predetermined
evaluation of the object. These associations are considered to be activated when the
attitude object, such as a behaviour, is recognised. In Fazio's view, an attitude biases the
perception of the attitude object, a process he considers an important determinant of
behaviour. This contrasts with the TRA, which considers attitudinal beliefs regarding
the outcomes of a behaviour to be important in determining behaviour.

Central to Fazio's (1986) model is the view that an attitude is based on a combination of
emotional responses toward the behaviour, conscious considerations of the behaviour,
and previous experience of the behaviour. A person is considered to learn about an
attitude object through their affective reactions, cognitive thought processes and
behavioural experience. When the attitude object is again encountered, or brought to
mind, a reaction is believed to arise as a conditioned response. A person is considered to be predisposed to perceive the attitude object in a certain way and this predisposition is interpreted as their attitude.

As this attitude can be formed in three different ways it is then possible for an attitude to be solely formed from affective or behaviourally based reactions. These reactions could presumably shape perceptions and produce a response with little conscious thought. Therefore, discerning conscious considerations, as promoted by Ajzen and Fishbein (1980), may only provide a limited view of attitudes because affective or behavioural components may not be adequately represented (Eiser, 1986). This argument can therefore be used to explain inconsistencies between attitudes and behaviour, in cases where attitudes are measured only through attitudinal beliefs.

Fazio (1986) also considers that attitudes must be readily accessible from memory for them to be a substantial determinant of behaviour. The ease with which attitudes are accessed on exposure to an attitude object is considered to be a main determinant of their power and functionality. An attitude which is more easily accessed from memory is also considered to be more likely to guide a person's thoughts and actions (Fazio, 1989). Attitudes have also been found to vary in strength, in terms of availability and stability, depending upon how they are acquired. Studies by Fazio and his associates found that people who repeatedly express their attitudes regarding a behaviour, or had prior experience of the behaviour, accessed their attitudes more quickly. In addition, their attitudes were found to be more correspondent with their actual behaviour and to be more stable over time.

Research on the effect of prior experience on the strength of the relationship between attitudes and behaviour, indicates that direct experience substantially improves consistency between attitudes and behaviour. Regan and Fazio (1977) for example, found that people who had worked on a number of puzzles, had better correlations between attitudes and behaviour than people who had simply examined the puzzles. Their study of attitudes and the behaviour of the signing of a petition, related to a shortage of student accommodation produced similar results. In addition, Fazio and
Zanna (1978) found that attitudes of students to becoming a subject for psychological experiments were more aligned to their behaviour for students who had previously participated. These studies demonstrated that prior experience of an attitude object produced more robust correlations between attitudes and behaviour, than attitudes that were not based on prior experience.

In further studies by Fazio, Powell and Herr (1983), attitude accessibility was also found to be enhanced by prior experience. Their review of Regan and Fazio’s (1977) experiments concluded that, with prior experience mere observation of the puzzles led to the evaluations of the object coming immediately to mind. Accessibility was comparatively more difficult for subjects who had not previously manipulated the puzzles. These people took longer to form and relate their attitudes, which was taken to indicate that their attitudes were less accessible and less functional.

In addition to finding that attitudes were bolstered by direct experience, Fazio et al. (1983) also observed that when subjects were required to make repeated evaluations of their attitudes the subjects attitudes became more accessible. Other studies have also found that the strength of attitude and behaviour correlations could be enhanced by having subjects repeatedly express their attitudes (eg. Fazio, Chen, McDonel, & Sherman, 1982; Powell & Fazio, 1984). People who had their attitudes reinforced in this way responded more quickly to inquiries of their attitudes and also tended to behave more consistently with their attitudes.

Fazio (1986) also asserts that attitudes that are more easily accessed could be activated automatically upon encountering the attitude object. Automatic activation is presumed not to involve any conscious thought or intentional evaluation of the attitude object. In experiments that tested for automatic activation, Fazio, Sanbonmatsu, Powell and Kardes (1986) compared response times with the number of times people had previously expressed their attitudes. Measurements were taken of the speed of response on presentation of the attitude object. Response times were so short for subjects who had stronger attitudes that it was presumed that no considered evaluation occurred and that their judgement of the object arose as an automatic response.
2.5.8 Combining evaluations of an attitude object with the Theory of Reasoned Action

The studies conducted by Fazio and his associates on the relationship between attitudes as learned associations and behaviour provide additional insights into attitude formation and expression. In terms of accessibility it has been found that attitude consistency and strength improved with direct experience and repeated evaluations. In addition, attitudes that are easier to access have a stronger effect on behaviour. Stronger attitudes are more likely to be accessed automatically, presumably without conscious consideration. Attitudes formed through affective, cognitive and behavioural means may differ in consistency and strength. In addition, conscious cognitive considerations may not arise when considering a behaviour and there is also some question of the ability to access attitudes that have an affective or behavioural basis.

Research regarding attitude accessibility has some contrasts with the TRA, the most notable being that attitudes are considered to be formed through learned associations, which are utilised upon further recognition of the attitude object. Attitudinal beliefs are a different formulation of attitude. These beliefs have been found to be useful when people are asked to consider not only an attitude object, but also factors such as time and location. Attitudinal beliefs are, however, conscious considerations that may provide limited expression for affective or behavioural reactions. Also, determining a person's attitudinal beliefs may not reveal whether they have an affective, behavioural or cognitive basis. These limitations can be addressed by considering that learning processes are associated with the formation of an attitude towards an attitude object. Attitudinal beliefs do not measure how an attitude is formed but capture the prominent considered evaluations related to both the attitude object and the situation in which it is encountered. Eagly and Chaiken (1993) therefore propose that learning processes associated with attitudes to attitude objects underlie attitudinal beliefs. This position enables the inclusion of a number of important influences that have the potential to enhance the understanding of the role of attitudes in predetermining behaviour. This positioning would also provide more support for the role of past behaviour as promoted by Bentler and Speckart (1979), with an additional explanation for a direct effect of an attitude on behaviour when attitudes arise automatically. Also, inconsistencies between attitudes and behaviour could be attributed to the inability of people to be consciously...
aware of their attitudes, which may have strong behavioural or affective components. People could also be considered to perceive an attitude object and react to it solely as a result of their conditioned attitudes. Learned responses would then be considered to have an influence on the formation of attitudinal beliefs and subsequently on intentions and behaviour.

2.6 Structuring attitudes towards purchasing food produced using genetic engineering.

Research indicates that attitudinal beliefs and subjective norms influence behaviours whose performance is subject to the motivations of the individual. It is also evident that other variables can be added to provide a fuller understanding of the motivations for these behaviours. This thesis utilises the other variable approach as promoted by Eagly and Chaiken (1993) and practiced by researchers who extend upon the TRA. In taking this approach the TRA remains a central concept in understanding personal motivations toward a behaviour. The sufficiency of the theory is, however, challenged as additional variables influencing intention may not always be fully mediated by the components of the TRA.

Drawing upon the review of the TRA and variations to the theory, there are a number of features of the behaviour of purchasing food produced using genetic engineering that could affect the performance of a model of this behaviour. It is questionable whether the public has a good understanding and awareness of genetic engineering and its products, which may cause them to be hesitant in forming an intention. A person's ability to form and act on his or her intentions is likely to also be impeded by the lack of labelling of these foods. Surveys conducted in New Zealand and studies from overseas have identified a diverse range of influences related to attitudes towards genetic engineering and its products. Identifying the nature, strength and relative importance of these influences within the structure of an attitude-behaviour model is a means of providing a fuller understanding of the behaviour of purchasing food produced using genetic engineering.
2.6.1 Familiarity with the behaviour

In a review of European surveys, Martin and Tait (1992) determined that the public was poorly informed about genetic engineering and its use in agricultural production. They considered that a lack of knowledge and understanding of the technology was a problem for conducting attitude surveys. Subsequent studies of attitudes towards genetic engineering conducted in Great Britain (Sparks, Shepherd & Frewer, 1994; Sparks, Shepherd & Frewer, 1995; Frewer, Howard & Shepherd, 1996) attributed poor response rates to unfamiliarity with the technology. Surveys conducted in New Zealand have found a better understanding and awareness of the technology than most other countries (Macer, 1998). In the months preceding the survey reported in this thesis, the use of genetic engineering in agriculture, and foods produced from this process have become popular topics in the media. It is therefore expected that public awareness is increasing and that many people have been drawn to consider arguments for and against the development and sale of food produced using genetic engineering. People may therefore be more able to form an attitude towards these foods and the technology, and can consider whether or not they intend to purchase the foods.

2.6.2 Control over behavioural performance

If personal ability, skills or resources are difficult to acquire for the performance of a behaviour, it can be expected that intentions will be formed with regard to these difficulties. It is then likely that, as Ajzen (1991) proposes, intentions will be influenced by the amount of control a person feels that he or she has over his or her performance of the behaviour. The inclusion of a measure of this control, as recommended by Ajzen (1991), should then improve the understanding of intentions and behaviour and aid in predictions of behaviour.

The ability of people to identify foods produced using genetic engineering is presently impeded by a lack of labelling of these foods. It is, however, possible to identify products that have been produced using genetic engineering from information compiled

\[\text{Index New Zealand, a database of New Zealand magazine and newspaper articles, reports that sixty-seven items related to food produced using genetic engineering were published in the six months prior to May 1999. In comparison, thirty-three related items were published in 1998.}\]
by organisations that oppose their sale. Some manufacturers have also publicly stated that their products contain no genetically modified ingredients and a few retailers are active in providing information as to which products are unlikely to contain genetically modified ingredients. Nevertheless, the lack of labelling on the products inhibits their easy identification, and it is expected that many people will feel they have a lack of control over their performance of the behaviour.

2.6.3 Past behaviour

Past purchasing of food produced using genetic engineering is not expected to influence intentions to purchase food produced using genetic engineering, as these foods have only been recently introduced and people may also be unaware they have been purchasing them. It cannot, however, be discounted that behaviours which presently involve discriminating between food products, based on how they were produced or based on a consideration of their contents, will be similarly applied to considerations of purchasing food produced using genetic engineering.

2.6.4 Self-identity

Opposition to the use of genetic engineering in the production of food has centred on claims that the technology poses unacceptable risks to the environment (Norton, 1998). Surveys conducted in New Zealand have noted concerns that the technology could produce harmful environmental effects (Couchman & Fink-Jensen, 1990; Macer; 1994 & 1998). The “green” consumer is commonly identified for marketing purposes, as they have preferences for goods and services which portray environmental concern (Beckmann, 1999). In the case of food produced using genetic engineering, it is possible that avoiding the purchase of these foods is an expression of environmental concern. This relationship has been found in a study by Sparks and Shepherd (1992) of the effects of self-identity on intentions to purchase organically produced food. In this study it was hypothesised that the effects of self-identity, in the form of the “green” consumer, would be mediated by the TPB. Their results, however, found evidence of an independent effect on intention for self-identity. The researchers concluded that self-identity incorporated personal morals and affective reactions that were not adequately
represented in the TPB. Sparks, Shepherd and Frewer, (1995) also tested self-identity in a variation of the TPB which sought expectations, rather than intentions, regarding the eating of food produced using genetic engineering and providing support for the development of the technology. Their study, which they admit was impaired by a lack of familiarity with the behaviours, found that self-identity made only a small independent contribution to explaining differences in expectations.

2.6.5 Personal morals

Personal morals, defined as personally held notions of right and wrong, are assumed to be related to, or develop from, social norms and ethics. The ethics of human intervention in natural processes has been associated with the use of genetic engineering in the production of food and has been identified in New Zealand surveys conducted by Couchman and Fink-Jensen (1990) and Macer (1994; 1998). As these foods produced using genetic engineering has been only recently introduced, personal morals may not be well formed because familiarity with the behaviour will be lacking. In these circumstances, Ölander & Thøgersen (1995) argue that a felt moral obligation, which they describe as a precursor to a personal norm, will affect attitudes and intentions to perform a behaviour. A variation of felt moral obligation has been tested with the TPB in the study of attitudes towards the use of gene technology in food production (Sparks, Shepherd and Frewer, 1995). These researchers found that perceived ethical obligation was an influence on attitudes, but no independent effect was found for a relationship with expectations regarding eating food produced using genetic engineering and providing support for the development of the technology. The ethical obligation was a felt obligation to consider others, which is similar to a personal moral, which incorporates a subjective assessment of right and wrong. However, as mentioned in the previous section, the study conducted by Sparks, Shepherd and Frewer (1995) may have been impaired due to the expectation that respondents would be unfamiliar with the behaviour. The researchers made a number of adjustments to the TPB to accommodate this expected lack of familiarity, which they admit leaves their findings open to the criticism that a stricter application of the central constructs might have produced different findings.
2.6.6 A model of the motivations to purchase food produced using genetic engineering.

In this thesis it is envisaged that New Zealanders are familiar with foods that have been produced using genetic engineering to the extent that they are able to form an attitude towards the purchase of these foods, and consider whether or not they intend to purchase these foods. Given that a person is able to consider rationally their actions, or plan his or her behaviour, applying the TRA or the TPB is expected to provide an understanding of the behaviour of purchasing these foods. As the choice of purchasing these foods is presently impeded by the lack of labelling, a variation of the TPB is applied, in preference to the TRA, because of its capacity to account for the amount of control a person believes they have over the behaviour. To understand further the motivations that determine intention, an additional variable, self-identity, is added to the TPB. Self-identity embodies predispositions that are expected to be an important influence on attitude while directly influencing intention.

Motivation

Past behaviour

Information and Elaboration

Self-identity

Attitude

Subjective norm

Perceived behavioural control

Intention

Figure 4. Motivations to purchase food produced using genetic engineering
The model depicted in Figure 4 represents the influences on intentions to purchase food produced using genetic engineering. The model is a variation on the TPB with the addition of self-identity. The components of the TPB are defined according to Ajzen (1991), with attitude being formed from attitudinal beliefs, subjective norm being formed from normative beliefs and perceived behavioural control being formed from control beliefs. Self-identity, attitude, subjective norm and perceived behavioural control are linked as they represent aspects of motivation. Intention is posed as a concept that represents a decision to purchase or not purchase food produced using genetic engineering. Intentions are determined by self-identity, attitude, subjective norm and perceived behavioural control, which are components of motivation. These four components of motivation are therefore presented as aspects of motivation that determine how the individual intends to behave. The link between intention and behaviour is not depicted because it will not be tested in this thesis, though research indicates that intentions generally correspond well with actual behaviour. Two further components, past behaviour and information and elaboration, are proposed to be mediated in their effects on intention by the motivational components of the model.

Self-identity is hypothesised as having a direct effect on intention independent of the components of the TPB. This particular sense of self-identity is held by a person who considers themselves to be environmentally friendly and health conscious. This is similar to the “green” consumer that Sparks and Shepherd (1992) used in their study of intentions towards eating organic vegetables. The relationship between self-identity and intention is as proposed and tested by Chrang et al. (1988). Their study found that performance of a behaviour influenced by self-identity “...conveys meaning over and above positive and negative attitudes we may hold towards the performance of the behaviour” (Chrang et al., 1998:304). Exactly what this meaning is remains unclear. Chrang et al. (1988) believe that the performance of a behaviour that is associated with self-identity, is best understood as a form of symbolic interactionism. That is, when a person repeatedly performs a behaviour he or she considers the behaviour to be part of his or her self-identity, which in the social context is reinforced by others treating them as a certain type of person. In modelling the motivations to purchase food produced
using genetic engineering this form of symbolic interactionism is not discounted, but self-identity is also considered to involve a conscious decision to behave in an environmentally friendly manner while also considering one's own health. Self-identity then incorporates reasoning which Sparks and Shepherd (1992) consider to be a personal norm that directly influences intention, as it is not fully mediated by the components of the TPB. In this research, self-identity is expected to correlate with attitude where attitudinal beliefs are related to personal health or related to the potential for the technology to have adverse environmental effects. Self-identity is also expected to have a significant independent affect on intention, as proposed byChrang et al. (1998).

Past behaviour represents prior purchasing of foods that are promoted as being environmentally friendly or as having health benefits. Past behaviour is similar to self-identity, as it involves an expression of environmental friendliness and concerns for personal health. Past behaviour is therefore expected to be associated with self-identity. Past behaviour is also expected to correlate with attitude where attitudinal beliefs are related to personal health and the technology's potential for adverse environmental effects. Past behaviour is not considered to have a direct effect on intention, as the individual must first undertake a consideration of the new behaviour before forming their intention. The effect of past behaviour on intention is therefore expected to be mediated by the motivational components of the model.

In the model, "information" is a measure of the amount of information that a person has been exposed to about foods produced using genetic engineering and "elaboration" is a measure of how much a person has talked with others about these foods. Information and elaboration are designed to be proxy measures of the amount of consideration a person has given to purchasing these foods. The component is related to attitudes, as defined by Fazio (1986), which in this case is towards the general target objects of genetic engineering and foods produced using genetic engineering. It is expected that attitudes towards these target objects will be a substantial influence on attitudes towards behaviour, as proposed by Eagly and Chaiken (1993). The media has been dominated by reports related to the possible environmental risks and health risks regarding the target
objects of genetic engineering and the foods it is used to produce. It is expected that, as Eagly and Chaiken (1993) propose, individuals draw upon their attitudes towards target objects in forming their attitude towards the behaviour. In keeping with research conducted by Fazio and his associates, more information and more discussion with others about target objects is expected to produce attitudes towards target objects, and subsequently attitudes towards a behaviour, that are less likely to change and more consistent with intentions and behaviour over time. These consistencies are not tested in this thesis. It is proposed, however, that information and elaboration will reinforce predispositions regarding the welfare of the environment and personal health that are embodied within self-identity.

Drawing from this description of the model of the motivations to purchase food produced using genetic engineering, the following hypotheses are to be tested in this thesis.

H1: Intention to purchase or not purchase food produced using genetic engineering will be formed from a combination of self-identity, attitude, subjective norm and perceived behavioural control.

H2: Self-identity, attitude, subjective norm and perceived behavioural control will each have a significant independent effect on intention.

H3: Self-identity, attitude, subjective norm and perceived behavioural control will be interrelated.

H4: There will be a significant positive correlation between self-identify and attitude.

H5: The components of past behaviour will be significantly associated with self-identity.

H6: The components of past behaviour will be significantly associated with attitude.

H7: The components of information and elaboration will be significantly associated with attitude.
These hypotheses were initially tested using focus groups, reported in chapter three. The hypotheses formed the basis for the development of a quantitative survey, which was designed to provide a formal test for the hypotheses. The development of the survey is detailed in chapter four and the results of the survey and the analysis of these results are reported in chapter five.
Chapter three

Focus groups

3.1 Introduction

Focus groups were used in this thesis to identify salient beliefs and to provide evidence for the effects of self-identity, past behaviour and information and elaboration on intention. This information forms the basis for the development of survey questions, which are presented in chapter four.

This chapter begins with a brief review of qualitative research methods. Of the methods presented focus groups are selected as the preferred method. A description is provided of the establishment of the three focus groups that were undertaken. A summary is provided of focus group discussions, salient beliefs are identified and evidence is provided for the effects of self-identity, past behaviour and information and elaboration on intention. The chapter concludes with a consideration of the model and its hypotheses in light of the results of the focus groups and attitudes towards companies, scientists and government agencies are added to the model as external variables.

3.2 Qualitative research methods

Qualitative research is generally focused on studying individuals or small groups of people in depth (Babbie, 1998). Qualitative research is a useful preliminary tool to aid in the development of a quantitative questionnaire and is also a useful analytical tool for the preliminary investigation of an under-researched area (Babbie, 1998). The approach can also be used to test or develop hypotheses and provides the opportunity for the exploration of insights of the reasons for performance of a behaviour, that may not have been previously considered by the researcher (Andreasen, 1995).

There are a number of qualitative methods that are useful for studying attitudes and intentions to perform a behaviour. Participant observation, in-depth interviews and
focus groups are three methods that are useful for identifying salient beliefs that comprise attitude-behaviour models (Andreasen, 1995).

Participant observation is a form of field research in which the researcher participates as an actor in the events under study. In studying the performance of a behaviour, experiencing the behaviour first hand leads to a greater understanding of the reasons for the behaviour (Andreasen, 1995). In undertaking participant observation it is often desirable for the researcher to maintain a degree of anonymity. This has ethical implications and can also prevent direct questioning of participants (Babbie, 1998). In terms of attitude-behaviour research, participant observation is valuable for providing the researcher with background knowledge of the behaviour and its participants (Andreasen, 1995). The approach is, however, limited because it may not be appropriate for the researcher to seek direct responses to research questions (Andreasen, 1995).

The in-depth interview is essentially a conversation in which specific topics are raised by the researcher who may ask questions and record answers (Andreasen, 1995). In the process of interaction between the researcher and the participant, questions act as prompts and the topic is explored with the researcher controlling the depth and focus of the conversation. The interview then serves as a means of gathering responses to prepared questions and as a method for learning more about the participant’s views and reactions to the topic (Babbie, 1998). The in-depth interview is useful for attitude-behaviour research because it enables answers to specific questions to be sought and the conversation provides the opportunity to explore the reasons for the performance of a behaviour (Andreasen, 1995). In-depth interviews are, however, time consuming and require the researcher to be adept at controlling the conversation, while enabling participants to speak freely about the topic (Babbie, 1998).

Focus groups require the researcher to discuss a topic with a group of participants in a similar manner to in-depth interviews. Focus groups are usually conducted using a general plan of inquiry, but generally do not use a specific set of questions to be asked in a particular order (Morgan, 1988). Questions that are presented to a focus group are usually open-ended to stimulate discussion about the topic of interest. Usually six to
twelve people are brought together to engage in a guided discussion of a topic. Groups of smaller numbers may not be large enough to encourage elaboration on the topic. Larger numbers can cause some participants to be bored or frustrated if they do not have the opportunity to speak (Babbie, 1998). More than one focus group is usually undertaken, as a single group may provide a limited range of views on a topic.

Focus groups are often preferred over other qualitative methods as they take less time and are less costly (Babbie, 1998). Focus groups are also conducive to the development of new perspectives on an issue or topic, as participants can build on the ideas of others (Andreasen, 1995). Disadvantages of focus groups are that they may be difficult to control; responses to questions may be indirect and difficult to analyse; through rephrasing questions and prompting group discussion, a degree of ambiguity is introduced that can lead to difficulties in interpreting responses; and, because the number of participants is generally small, their views may be only partially representative of the views of the wider population (Greenbaum, 1998). Focus groups are, however, useful for developing an understanding of the attitudes and opinions of participants and are also useful for the development of a quantitative survey (Morgan, 1988).

In considering the purchase of a product, Ajzen and Fishbein (1980) consider that salient beliefs can be obtained by simply asking participants to relate the characteristics, qualities and attributes of the product and anything else that is important when they consider purchasing the product. Ajzen and Fishbein (1980) consider that there is no need to search for unconscious reasons or hidden meanings, as simply questioning participants will be sufficient for revealing the motivations for behavioural performance. Interviews using open-ended questions are then favoured, though Ajzen and Fishbein (1980) consider it appropriate to use pilot questionnaires when salient beliefs can be identified from prior research.

To research the motivations and intentions to purchase food produced using genetic engineering, qualitative research was undertaken with the objectives of identifying salient beliefs and initially testing the hypotheses associated with the model of the
intentions to perform this behaviour. Qualitative research was considered to be important for determining salient beliefs because little attitude-behaviour research has been undertaken of this behaviour. Focus groups are chosen as the preferred qualitative research method due to budgetary and time constraints and because they allow for exploratory research. An additional benefit, not immediately apparent from the literature, is that seeking agreement from a group of people regarding their salient beliefs reduces the need to later analyse and structure responses to determine their most salient beliefs.

3.3 Focus groups

Three focus groups were undertaken in April, 1998. Ten participants per group were sought from two suburban areas and ten participants from one rural area. The selection of participants was determined by the area in which they lived. The areas considered were unit areas from the Supermap Two database, which contains information drawn principally from census data. One suburban unit area was chosen because it comprised residents of mid to low income and the other suburban unit area was chosen because it comprised residents of mid to high average income, relative to other unit areas of Christchurch. A rural unit area was chosen to offset the possible bias from solely interviewing suburban residents. The rural area had an average personal income slightly higher than the average for Christchurch residents. Suitable venues were booked within each unit area and letters of invitation with a booking form and a pre-paid return envelope were distributed to randomly selected households in the unit areas. One hundred and fifty letters were distributed per unit area.

Ten people were booked for the first meeting. Three enquiries were received by telephone asking if spouses or friends could also attend this meeting. These were politely refused on the grounds that only ten people were invited to enable everyone to have an opportunity to speak. Nine people were booked for the second meeting and only one telephone inquiry was received from a respondent who required and received an

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4 Sparks, Shepherd and Frewer (1995) used the TPB to research expectations of eating genetically modified food and providing support for gene-technology. Their research, however, did not utilise qualitative methods, as participants were expected to be unfamiliar with the technology and its products.
assurance that the research was not being undertaken to promote the use of genetic engineering or to promote the sale of food produced using genetic engineering. The third meeting received thirteen bookings. The last three bookings received were contacted by telephone and they agreed not to attend the meeting. One telephone call was received from a person who would have liked to attend but was unable to, and one person phoned and offered to attend if more participants were needed. In addition to telephone calls regarding the meetings, four people sent letters of apology, as they were unable to attend a meeting.

Eight men and eighteen women participated in the groups making an overall total of twenty six participants. Nine attended group one, seven attended group two and ten attended group three. Two apologies for non-attendance were received prior to group two. The age of the participants ranged from early twenties to late sixties.

The groups were moderated solely by this researcher. Offers of assistance by my research supervisors were declined, as a single moderator was considered to be less imposing for participants. The Lincoln University Human Subjects Ethics Committee was consulted regarding the use of human subjects for this research. The committee did not require a formal application for the focus groups, advising that a formal application should be made before conducting the postal survey. Procedures were, however, established in keeping with the policies of Lincoln University regarding the use of human subjects in research. It was planned to tape record each meeting and informed consent to participate in the meetings was gained from all participants. As the recorder failed to operate at one meeting only two of the meetings were recorded. Brief notes were taken during the unrecorded meeting and a white board was used during the last part of the meeting. Further notes were also made immediately after the participants had left the meeting.

An overhead projector was used in the meetings and five transparencies were prepared as prompts for discussion. It eventuated that only two transparencies were required.
The first transparency presented two research questions to provide a focus for the discussion and also presented a further six questions designed to prompt discussion. The overhead stated:

Will people purchase food produced using genetic engineering?
What are the reasons for their choice?

What is genetic engineering?
What foods are being engineered?
Why are they being engineered?
What are the risks?
Should they be labelled?
Will people feel comfortable eating foods that have been modified?

The second transparency presented a layperson's definition of genetic engineering, which stated:

Genetic engineering involves the transfer of genetic material from one living thing to another. Living organisms can be animals, plants or microorganisms. It is a process that enables scientists to transfer desirable characteristics from one living thing to another.

At the beginning of each meeting each participant was given a nametag displaying his or her first name. Participants were then informed of the purpose of the meeting, that their participation was voluntary and that their anonymity would be preserved. Participants were then given a consent form, which they signed and returned at the close of the meeting. Participants were informed that it was planned to tape record the meeting, subject to their approval. Approval to tape record the meeting was given by all participants. With the agreement of participants the first forty five minutes of the meetings were reserved for open discussion after which refreshments were taken. During these discussions the conversation was facilitated so that everyone had an opportunity to speak and to ensure that a wide range of issues and aspects of the topic were discussed. At various points in the discussion participants were asked whether the
issue or topic of discussion influenced their intentions to purchase the foods. In addition, participants were asked about the views of their family and friends, how much control they had over the behaviour, whether they had moral or ethical concerns and whether they presently purchased food based on a consideration of their health or environmental friendliness. After taking refreshments the groups were reformed and with the assistance of the group the researcher provided a summary of the main points of the discussion. The group then indicated the most important factors that influenced their attitudes and intention.

3.4 Summary of focus group discussions

The following is a summary of the group discussions. The summary is structured to present issues of relevance to this thesis that were discussed by the participants and does not represent the order in which these issues were discussed. The importance of an issue is determined by how much the issue was discussed, whether the issue was raised by all the groups, and whether participants considered it to be important. It is noted that much of the discussion of the groups related to issues associated with topics such as the use of genetic engineering in food production, or attitudes towards scientists, and only indirectly to the behaviour of purchasing foods. Participants were, however, adamant that their attitudes towards such topics influenced their attitudes and intentions to purchase or not purchase the food.

3.4.1 Environmental risk

All participants agreed that the use of genetic engineering in food production was a risk to the environment. Only one participant considered that scientists were able to identify and minimise these risks. Participants discussed issues of risk such as, the risk of modified plants pollinating other species, the possibility that modified plants would become superweeds, and the risk of modified plants upsetting the “balance of nature”. Two of the groups discussed these issues in terms of what occurs in their gardens. Most
participants appeared to be familiar with these issues. A few participants just listened initially and appeared to understand quickly and then contributed to the discussion.

The topic of environmental risk was only suggested to the groups, with the discussion of aspects of the topic arising from the participants' discussion. All of the groups also discussed the risk to New Zealand's "clean green image" and expressed concern that genetic engineering would tarnish this image and be detrimental to overseas trade. Participants were generally concerned that the environmental risks were too great and that the assessment of these risks by scientists and the government were inadequate. However, only two participants in separate groups had heard of the Environmental Risk Management Authority (ERMA), the government agency responsible for environmental risk assessment, and no participant knew about government policies and regulations that governed the use of the technology.

3.4.2 Health risk

Participants were concerned that food produced using genetic engineering would be harmful to their health. One person considered that the risk of harm would be no more than for eating other types of food. Two participants in another group considered that the foods would be safe to eat, but had concerns about the possibility of harmful effects on future generations. Participants considered that testing of the safety of the food was inadequate and that it should be subject to the same tests as medicines. Two groups felt that at present the foods were being tested on the public and considered more tests should be done before they were released for public consumption. Participants were not aware of current safety regulations that applied to these foods and had not heard of ANZFA (The Australia and New Zealand Food Regulation Authority).

An issue that arose in the first group was that the participants were more concerned for the health of others than they were for themselves. A belief was expressed by one participant that sometime eating these foods will poison some people, though it was stated that this was extremely unlikely to happen to the participant. The rest agreed and subsequently the other groups, when asked, also agreed with this view.
3.4.3 Consumer benefits

Participants believed that genetic engineering could produce better quality food for the consumer. Participants liked the idea of tomatoes that were modified to improve their shelf life without the introduction of foreign genes. Participants were also interested in the example of flowers that were modified to produce a wider range of colours. Participants were aware that most modifications were being made to improve production processes and approved of the reduction in the use of chemicals in agricultural production. Two of the groups discussed the advantages of growing genetically modified vegetables in their gardens. On the topic of purchasing milk produced by cows that had human genes, one participant thought the milk would be more natural for babies. The other participants, however, found the combination of human genes with another animal to be offensive. The participants appreciated that increased production of food was needed to feed the growing population. Economic growth for New Zealand was seen to be enhanced by the technology, though the introduction of the technology was also considered to compromise the prospect of increased overseas sales of organic produce.

3.4.4 Attitudes towards companies, scientists and government

Most participants made negative comments about companies involved in the introduction and development of foods produced using genetic engineering. Only one participant spoke about the companies approvingly and made a number of references to a television documentary which interviewed scientists who worked for the American company Monsanto. Other participants believed that Monsanto sought to dominate agricultural production by patenting life forms, selling plants which could only be treated with their herbicides and modifying plants so their seeds were sterile. Participants also believed that companies such as Monsanto are powerful enough to influence governments to favour the introduction of their products. One participant stated that they actively rejected many products based on an evaluation of the integrity of the company that produces them and would not purchase products produced by Monsanto solely on these grounds.
Scientists were considered by the participants to be associated with the companies that are involved in the development of foods produced using genetic engineering. In addition, the independence of research conducted by universities was considered to be compromised due to funding by private companies. Scientists were also criticised, as it was believed that they gave little consideration to the outcomes of their research. One participant summed up the views of one group by stating that “scientists work better in a moral vacuum”. The general opinion was that scientists involved in the development and assessment of food produced using genetic engineering were influenced by funding from the private sector and the need to further their own careers.

The government was considered to condone the introduction of food produced using genetic engineering in the interests of the New Zealand economy. In comparison, the interests and rights of the consumer to be informed and educated about the foods and the technology were said to be less important. Participants believed that the lack of labelling of these foods was evidence that the government did not wish to give the public the opportunity to impede their introduction to the marketplace. It was also believed that the government was influenced by large multinational companies that promoted food produced using genetic engineering. One group discussed the pressure on government to establish the technology in New Zealand ahead of other nations. The rural group considered that government agencies were now more interested in undertaking research for overseas companies than assisting the rural community. Participants appeared to be unaware of the government agencies, their policies or legislative provisions that were designed to control the introduction and development of genetic engineering and the sale of foods produced using the technology.

3.4.5 Control over purchasing food produced using genetic engineering
Participants were aware that at the time there was no requirement to label foods that were produced using genetic engineering. Many were aware that some foods sold in New Zealand could contain genetically modified ingredients. All groups discussed modified soy and many were aware that imported soy products, some of which are modified, were used in the manufacture of bread and pastry. Participants believed that it
was in the interests of companies that produced these foods to avoid labelling food that was produced using genetic engineering.

When asked what effect the lack of labelling had on their intention, participants agreed it would be difficult to act as they intended. They did, however, indicate that not all foods were being modified and it was possible to identify types of food, such as bread or pastry, that could have ingredients produced using the technology. Two participants from separate groups had seen, in a health food shop, a list of foods that had not been produced using genetic engineering. Only one participant made food purchase decisions based on beliefs regarding whether the foods had been produced using genetic engineering.

Participants were also asked whether the lack of labelling of foods affected their attitudes towards purchasing these foods. Participants related that the lack of labelling annoyed them because the public had a right to be informed. The participants, however, indicated that their attitudes towards the foods and towards purchasing the foods were not affected by the lack of labelling.

3.4.6 Ethical and moral concerns

During open discussion no participant raised the issue of ethical or moral concerns over the use of genetic engineering to produce food. When questioned about ethical or moral concerns, participants seemed to be hesitant in relating them to the issues. Participants were then asked if they thought it was right for scientists to be intervening in natural processes. A participant in the first group replied that scientists have always “played around with nature” and genetic engineering was no different. The group agreed with this participant’s comment and when the comment was related to subsequent groups they also agreed with it. Most participants did, however, display an adverse reaction to combining human genes with other life forms.
3.4.7 Self identity and related behaviour

Participants were not directly questioned about their self-identity. Participants were, however, questioned about whether they currently purchased foods based on environmental friendliness and health benefits. Most participants indicated they considered the nutritional value of foods they purchased. Two participants related that they preferred to grow their own vegetables rather than purchase vegetables that may have been chemically treated. One participant read information displayed on processed food and told the group how to get information about codes used for food that contained additives that are displayed on packaged food. Four participants regularly purchased organic food. One of these participants appeared to be agitated that organic foods were often difficult to find, but also expressed distaste at the poor appearance of many of these products. One participant purchased food based on a personal assessment of the integrity of the company that produced the food and indicated that the same rationale would be applied to food produced using genetic engineering.

Two of the participants who attended separate groups had a series of sophisticated arguments against genetic engineering and the foods it is used to produce. Both participants related a string of objections including detailed articulation of environmental and health risks, conspiracy theories involving governments and companies promoting the foods and the bias of scientific research. Another participant confidently supported the production and sale of the food and defended his position a number of times with the assurance that scientists knew what they were doing.

3.4.8 The views of others

All participants had previously discussed, with family and friends, food produced using genetic engineering, but only a few had discussed whether or not they would purchase these foods. Most participants indicated that their family and friends were in agreement with their views on the issue, rather than stating that they agreed with the views of their family and friends. Participants indicated that these discussions centred on what genetic engineering was and the possibility that the products would be harmful to human health.
3.5 Salient beliefs and other important influences on intention

Drawing from the summary of the focus groups the following beliefs and other influences were found to be important influences on intention.

3.5.1 Salient beliefs

Attitudinal beliefs
- The use of genetic engineering in food production is a risk to the environment.
- Food produced using genetic engineering is a risk to public health.
- Food produced using genetic engineering is a risk to personal health.
- The production of food produced using genetic engineering will be harmful to future generations.
- The production of food produced using genetic engineering will benefit multinational companies.
- The production of food produced using genetic engineering will result in economic growth.
- The production of food produced using genetic engineering will produce better quality food.
- The production of food produced using genetic engineering will reduce the use of harmful chemicals in food production.

Normative beliefs
- Friends and family are in agreement with the participants' views and are supportive of their intentions regarding the purchase of food produced using genetic engineering.

Control beliefs
- It is difficult to purchase food produced using genetic engineering because these foods are not labelled.

3.5.2 Other influences on intention

Self identity and past behaviour
- Participants purchased food based on health benefits.
• Participants purchased food based on environmental friendliness.
• Participants, who regularly purchased food that they judged to be beneficial to their health or friendly to the environment, indicated that the same purchasing behaviour would be applied to food produced using genetic engineering.

**Information and elaboration**
• Participants reported that they had discussed with others food produced using genetic engineering.
• Participants had read about food produced using genetic engineering and some participants had seen television programmes about the food.
• One participant confidently stated his intention to purchase the food and two participants were ardently opposed to purchasing the food. These participants appeared to be well informed and presented a range of complex arguments to justify their views.

3.5.3 **Attitudes towards companies, scientists and government**
Participants from the focus groups spent a good deal of time discussing their attitudes towards companies, scientists and the government, regarding the development and sale of food produced using genetic engineering. These attitudes were considered by the participants to be influential on their attitudes and intentions to purchase the food produced using genetic engineering. Given that these attitudes may not be able to be specifically addressed by salient beliefs and that they are an important influence on attitude and intentions regarding the purchase of these foods these attitudes are included as external variables to the model with their influence on intentions being mediated by the motivational components of the model.

3.6 **Implications for the model and hypotheses**
The results of the focus groups indicate that there is no reason to revise the hypotheses or the related model developed in chapter two. The addition of attitudes towards companies, scientists and government, as external variables to the model, are not
expected to alter the model or the hypotheses. This relationship then forms the following hypothesis:

H8: Belief in statements by companies, scientists and government agencies will each have significant associations with the hypothesised determinants of intention.

Two further observations that may have implications for the model are arguments that are used to justify attitudes and intention and evidence of a single reason for intention. An assumption of attitude-behaviour models is that the factors encapsulated by the components of these models have a combined causal effect on intention. In the focus groups, however, one participant stated that only one factor, the integrity of a company, determined the participant’s intention. In addition, another participant continually referred to his confidence in scientists and two participants related a series of arguments that seemed to justify a predetermined attitude and intention. Ajzen and Fishbein (1980) recognise that this can occur and indicate that attitude-behaviour models do not necessarily represent the reasons for the intentions of all individuals and that their model is best considered as a representation of the most common reasons within a population.
Chapter four

Questionnaire development

4.1 Introduction

Quantitative surveys are a means of describing the characteristics of a large population. Their purpose is to present a sample of the population with standardised questions to enable refined descriptive assertions to be made about the wider population (Babbie, 1998). The questionnaire used in this thesis was designed to gather information about intentions regarding the purchase of food produced using genetic engineering and the influences on these intentions. This information was sought to enable the model of the influences on intention to be tested. The information was also sought to enable projections to be made of the intentions, and influences on these intentions, for the wider population.

This chapter begins with a brief review of quantitative survey methods. Of the methods presented the postal questionnaire is selected as the preferred survey method for this thesis. The design of the questionnaire is described, the need to represent an individual’s thought processes is discussed and the method of statistical analysis is introduced. An explanation for the construction of questions used in the postal questionnaire is then provided. The chapter closes with details of the distribution of the questionnaire.

4.2 Quantitative research methods

Quantitative surveys can be administered in a number of ways. Three common methods are interviews, telephone surveys and the postal questionnaire (Babbie, 1998).

Interview surveys involve interviewers asking respondents face-to-face for their responses to survey questions. The main advantages of an interview survey are that response rates are generally higher than other methods and a higher proportion of the surveys can be expected to be completed because the interviewer may assist respondents in understanding the purpose of the survey and the meaning of survey questions (Hall &
Hall, 1998). Disadvantages of interview surveys are that they require the time of the researcher for the interview and costs can be incurred in travelling to the interview. In addition, respondents may not easily report their attitudes and honestly report their intentions to the interviewer, even when the anonymity of the respondent is assured (Babbie, 1998).

Telephone surveys have advantages over interview surveys because less time is taken in the field and because the interviewer is less imposing (Babbie, 1998). Respondents can, however, easily terminate the interview by hanging up the phone and the interviewer may be associated with intrusive marketing or sales promotions (Babbie, 1998).

The postal questionnaire is a basic method for data collection that normally involves the distribution of a questionnaire with a letter of introduction accompanied by a prepaid return envelope. Postal questionnaires take less time to administer for researchers than an interview or telephone survey, though response rates are generally poorer (Babbie, 1998). Postal questionnaires can provide accurate responses, especially to sensitive issues, because the respondent does not have to reveal his or her responses to an interviewer (Babbie, 1998). Further advantages are that respondents may take more time to consider their answers and postal questionnaires contact more respondents than interview or telephone surveys because respondents do not need to be at home to take receipt of the survey (Millar, 1991).

The postal questionnaire was selected as the most appropriate method to conduct the quantitative survey for this thesis. This selection was made because it allowed for responses to be taken from a wide area, so as to be representative of the population of the area. The method was also selected because it is less costly and time consuming than face-to-face interviews or telephone surveys which were beyond the available budget.

4.3 Questionnaire design

A questionnaire was constructed for the purposes of gathering information to test the model of motivations to purchase food produced using genetic engineering and its
related hypotheses. Information for the development of the questionnaire was drawn from the results of the focus groups. Two main considerations, the method of statistical analysis and the assumption that attitude-behaviour models represent cognitive processes, influenced the design of the questionnaire.

4.3.1 Method of statistical analysis

The TRA and the TPB traditionally utilise regression analysis as a method of statistical analysis. A necessary assumption for regression analysis is that the dependent variable is cardinal. However, social research often examines choices between discrete categories, such as the choice between purchasing or not purchasing a product. In these situations statistical models that are designed to link a set of factors to a discrete choice are required. The development of multinomial modelling techniques and their availability through statistical packages, enables the analysis of a dependent variable as discrete categories (Greene, 1990). Multinomial analysis, using ordered logit modelling, was undertaken in this thesis and is discussed in Chapter Five. The measurement of intention and an argument for its measurement as discrete categories are discussed in section 4.4.1. of this chapter.

4.3.2 The representation of cognitive processes

Attitude-behaviour models are designed to be representations of cognitive processes. Ajzen and Fishbein (1980) assume that people form their intentions by thinking about their attitude toward the behaviour and subjective norm, which they form from beliefs about the outcomes of the behaviour and beliefs of what important others think of them performing the behaviour. Eagly and Chiaken (1993) consider that people who answer a questionnaire are fully capable of retrieving the specific beliefs that underlie their attitude towards the behaviour and their subjective norm. Eagly and Chiaken (1993) do, however, question the amount of thoughtful consideration that is given to the performance of a behaviour. Ajzen and Fishbein (1980) assume that when a person considers performing a behaviour he or she generally only draws upon only seven to nine attitudinal beliefs to form an attitude towards the behaviour. This assumption is based on the view that people have a limited capacity to consider and process
information. An alternative view is that people tend to reduce the amount of effort involved in making personal decisions, so they utilise only a small number of considerations compared to the number that could potentially be drawn upon (Earl, 1986). An implication of both of these views is that people make a limited number of considerations in making a decision. Therefore it is an imperative that attitude-behaviour models limit the number of considerations to what respondents indicate are the most important, rather than presenting a full range of possible considerations.

4.4 Measurement of variables

Independent variables were measured using seven point semantic differential scales. All points on these scales were anchored with a corresponding statement. The dependent variable, intention, was measured in ordered categories. Information about sex, age, income and qualification was gathered using a variety of measures. The following is an explanation of the items and measures used in the postal questionnaire. A copy of the questionnaire, which was approved for distribution by the Lincoln University Human Subjects Ethics Committee, is provided in Appendix 1.

4.4.1 Intention

Intentions regarding the purchase of food produced using genetic engineering were measured using one question: Which of the following statements best represents your intention to purchase or not to purchase food produced using genetic engineering? Respondents could indicate their agreement with one of five statements:

- I have a strong intention to purchase food produced using genetic engineering.
- I intend to purchase food produced using genetic engineering
- I have no intention to purchase or not to purchase food produced using genetic engineering.
- I intend not to purchase food produced using genetic engineering.
- I have a strong intention not to purchase food produced using genetic engineering.
This form of measurement is different from Ajzen and Fishbein's (1980) recommended measure of the likelihood that a person would intend to perform a behaviour. Their measure utilise a cardinal measure, which is appropriate for statistical analysis using regression. In taking responses in the form of five statements, intention is treated as an ordered categorical response. Central to the categories is the dichotomy that one either intends to perform a behaviour or intends not to perform a behaviour. This is arguably closer to the common use of the term, intention, in which a person usually states they either intend or do not intend to perform a behaviour. Three categories of intention were presented, as a person may either intend to purchase, intend not to purchase, or have no intention to perform either behaviour. In addition, two categories representing strong intentions were provided for respondents who more easily identify with these statements.

4.4.2 Attitude towards the behaviour

Eight attitudinal beliefs were used to measure attitude towards the behaviour of purchasing food produced using genetic engineering. Seven of these beliefs formed fourteen questions about consequences of the use of the technology. These beliefs were transformed into consequences of purchasing the food by having respondents indicate the likelihood that their purchase of the food would result in these consequences. All beliefs were measured using two questions, one question assessed the importance of the consequence and one question assessed the likelihood of its occurrence. "Importance" was measured on a seven-point scale of desirability, as used in a TPB study by Ajzen and Driver (1992) and likelihood was measured on a seven point scale, as recommended by Ajzen and Fishbein (1980).

The belief that the use of genetic engineering in food production is a risk to the environment was presented as; Damage to ecological systems from the use of genetic engineering in food production is: (Extremely desirable-Extremely undesirable); Damage to ecological systems is: (Extremely likely-Extremely unlikely). These statements are different from that stated by the focus group participants and was formed to avoid possible ambiguity arising from using the term "environment". Focus group participants used the term "environment" when discussing ecological systems.
The remaining six beliefs, which readily approximate with the salient beliefs of focus group participants (Section 3.5) were presented as the following questions:

*New risks to public health from the use of genetic engineering in food production are:* (Extremely desirable-Extremely undesirable).

*New risks to public health are:* (Extremely likely-Extremely unlikely).

*The development of better quality food from the use of genetic engineering in food production is:* (Extremely desirable-Extremely undesirable).

*The development of better quality food is:* (Extremely likely-Extremely unlikely).

*Enhanced economic growth from the use of genetic engineering in food production is:* (Extremely desirable-Extremely undesirable).

*Enhanced economic growth is:* (Extremely likely-Extremely unlikely).

*Increased profits for multinational companies from the use of genetic engineering in food production are:* (Extremely desirable-Extremely undesirable).

*Increased profits for multinational companies is:* (Extremely likely-Extremely unlikely).

*Adverse effects on future generations from the use of genetic engineering in food production are:* (Extremely desirable-Extremely undesirable).

*Adverse effects on future generations are:* (Extremely likely-Extremely unlikely).

*A reduction in the use of harmful chemicals in agriculture from the use of genetic engineering in food production is:* (Extremely desirable-Extremely undesirable).

*A reduction in the use of harmful chemicals is:* (Extremely likely-Extremely unlikely).
These seven pairs of questions related to the consequences of using the technology to produce food. Respondents were asked these questions without reference to their being a consequence of purchasing the food. The seven pairs of questions were linked to the behaviour of purchasing the food by asking; *How likely or unlikely do you think it is that your purchase of food produced using genetic engineering will support the development and use of this technology?* This question was answered on a seven-point scale from “extremely unlikely” to “extremely likely”.

This arrangement was a departure from the usual format for these questions. Ajzen and Fishbein (1980) recommend asking directly about beliefs regarding the consequences of a person’s behaviour. Ajzen and Fishbein’s (1980) approach would have been employed in this thesis; however, two factors resulted in the development of an alternative approach.

First, it is desirable to have concise, unambiguous questions and statements in a questionnaire. Presenting complete statements based on the beliefs presented above that relate to both the consequences of using the technology and the consequences of purchasing the food produces lengthy and ambiguous statements. For example, a question from an earlier draft of the questionnaire stated: *Providing support for a technology that will increase profits for multinational companies by purchasing food produced using genetic engineering is: (Extremely desirable-Extremely undesirable, Extremely likely-Extremely unlikely).* Note that in this statement purchasing food has two consequences, providing support and increasing profits. A number of rearrangements of this type of question were undertaken which included stating the support outcome in a heading for the set of questions. These arrangements were, however, unsatisfactory, as they were unable to remove ambiguity from these questions.

Second, through reconsideration of the focus group discussions it was found that participants stated a belief about a consequence of the technology and then stated separately that the consequence resulted from their purchasing the food. The final set of questions was then reflective of the way people consider these outcomes and related them to their intentions regarding the purchase of the food.
A further belief that food produced using genetic engineering is a risk to personal health was presented in two questions. *How desirable or undesirable would it be to place your own health at risk by purchasing food produced using genetic engineering? (Extremely desirable-Extremely undesirable); How likely or unlikely is it that you will place your own health at risk by purchasing food produced using genetic engineering? (Extremely likely-Extremely unlikely).* This belief centres on a direct consequence of purchasing the food as expressed in a single unambiguous statement by focus group participants. Transformation into the question style of the other seven belief questions was therefore unnecessary.

Attitude towards the behaviour was formed by first multiplying together the likelihood and desirability scores for each of the eight belief questions. The products of the first seven belief questions were summed together and multiplied by the likelihood that the seven consequences would result from purchasing the food. The product of the remaining belief questions, regarding the desirability and likelihood of placing ones health at risk, was then added to this result after being weighted to ensure that each consequence had the same relative importance. This produced a single measure for attitude towards the behaviour and ensured that each consequence had equal weighting, as specified by Ajzen and Fishbein, (1980).

### 4.4.3 Subjective norm

The belief that friends and family are in agreement with the respondents' views and are supportive of their intentions regarding the purchase of food produced using genetic engineering was measured using the question; *In general what do you think your family or friends views would be of you purchasing food produced using genetic engineering? (Extremely unfavourable-Extremely favourable)* Motivation to comply with this belief was measured by asking: *How likely or unlikely is it that your intention to purchase or not purchase food produced using genetic engineering is determined by the views of your family and friends? (Extremely unlikely-Extremely likely).* Responses to the two questions were multiplied together to produce the subjective norm.
4.4.4 Perceived behavioural control

The belief that it is difficult to purchase food produced using genetic engineering because these foods are not labelled was measured by asking; *How easy or difficult is it to purchase or avoid purchasing food produced using genetic engineering?* (Extremely easy-Extremely difficult). The perceived power of this belief was measured by asking: *How much control do you think you have over whether you can purchase or avoid purchasing food produced using genetic engineering?* (No control at all-Complete control) The two measures were designed to be summed together to provide a measure of PBC. The first question, however, mistakenly made reference to a general view rather than a personalised view of how difficult or easy it is for the respondent to purchase of avoid purchasing the food. The first question therefore served as a consistency check and was not included in the measurement of PBC. PBC was then measured solely by the second question. The second question then stands as what Ajzen (1991) refers to as a global measure of PBC. Global measures were shown by Ajzen (1991) to be a poorer representation of PBC than a combination of a number of control beliefs. No comparisons have, however, been made between a global measure and a single belief.

4.4.5 Self-identity

In analysing the focus groups no single term could be found that described the sense of self-identity that would affect their intentions to purchase food produced using genetic engineering. In previous studies Sparks and Shepherd (1992) used the “green consumer” as a self-identity label for purchasers of organic food and Sparks, Shepherd and Frewer (1995) used “someone who is concerned about environmental issues” as a self-identity label in the study of expectations of eating food produced using genetic engineering and expectations of providing support for the development of the technology. In this study, however, two labels for a sense of self-identity were identified from the focus groups, the first being an environmentalist and the second being a health conscious person with neither being exclusive of the other. A self-referent form of labelling was therefore employed and it was envisaged that other questions regarding past behaviour and attitude towards the behaviour would provide further understanding of self-identity. Self-identity was measured using the following two questions: *I am the type of person*
who will purchase food produced using genetic engineering. (Very strongly disagree-Very strongly agree). I am the type of person who will not purchase food produced using genetic engineering. (Very strongly disagree-Very strongly agree) To combine the questions the first was coded minus three to three and the second question was coded three to minus three. The two were summed to form a measure of self-identity. Combining the two questions in this way enabled contrasting responses to offset each other. For example, a person who very strongly agreed they were the type of person who would purchase and also very strongly agreed that they were the type of person who would not purchase would result in a neutral score of zero.

4.4.6 Past behaviour
Past behaviour was measured using three questions. How often do you purchase groceries for your household? (Less than once a month-More than five times a month); How often is your choice of which foods to purchase based on your beliefs about whether or not additives are contained in the food? (Never-Always); How often is your choice of which foods to purchase based on your beliefs about whether or not herbicides or pesticides were used in their production? (Never-Always). The questions produced three separate measures of aspects of past behaviour.

4.4.7 Information and elaboration
In the interests of brevity only one question was asked about sources of information; How many newspaper items have you read about food produced using genetic engineering? (None-More than eight). This question was preferred over other questions regarding other information sources because, in general, focus group respondents said that reading the newspaper was their primary source of information about the topic.

One question asked about elaboration of the topic; How much time have you spent talking with other people about food produced using genetic engineering? (Less than ten minutes-More than two hours).
4.4.8 Attitudes towards companies, scientists and government

The following three questions were asked in relation to attitudes towards companies, scientists and government agencies:

*How likely or unlikely is it that you would believe statements about the benefits and risks of producing food using genetic engineering by a company engaged in its development? (Extremely unlikely-Extremely likely).*

*How likely or unlikely is it that you would believe statements by university scientists about the benefits and risks of producing food using genetic engineering? (Extremely unlikely-Extremely likely).*

*How likely or unlikely is it that you would believe statements by a government agency about the benefits and risks of producing food using genetic engineering? (Extremely unlikely-Extremely likely).*

These questions were asked to measure whether or not respondents believed statements made by these different groups. The questions were shaped to better understand the extent to which communications from these groups were influential on intention.

4.4.9 Demographic information

No relationship between demographic information (eg. sex, age, income and education) and components of the model are proposed in this thesis. However, for the purposes of making generalisations, to enable tests to be made of the representativeness of the survey and to explore possible relationships between this information and other components, information regarding sex, age, income and education was sought from respondents.

4.5 Pretesting

Pretesting of the questionnaire was undertaken at a public hospital in Christchurch. Sixteen staff employed in a range of positions, including domestic workers and nursing
staff, completed the questionnaire. Each of the staff members were subsequently interviewed and said they had no difficulty understanding the instructions in the survey and answering the questions.

4.6 Survey distribution

Twelve hundred questionnaires were distributed to randomly selected households in the Canterbury region. This region was selected because the focus groups were conducted in rural and urban locations in this region. Distribution was restricted to this region so that the survey would be representative of the population of Canterbury. The questionnaire was posted to respondents in the form of a booklet with a letter of invitation and a freepost return envelope. The household addresses were derived from a list of twelve hundred addresses of telephone subscribers that were randomly selected by Telecom New Zealand from both listed and unlisted Canterbury telephone subscribers. This selection method can be considered biased towards telephone subscribers, though this bias is small because only 3.3% of households in the region are not telephone subscribers (Department of Statistics, 1997).
Chapter five

Results

5.1 Introduction

This chapter presents the results of statistical analyses designed to test the model of intentions regarding the purchase of food produced using genetic engineering and its related hypotheses. The chapter begins by introducing the statistical methods that are employed in this analysis. Specifications are then provided for an ordered logit model and methods are identified for interpreting the results of the ordered logit model. The response rate for the postal questionnaire is then provided, followed by the presentation of demographic information and an evaluation of the representativeness of the questionnaire. A description of the components of the model is provided with an explanation of the construction of model components. Relationships between components are then analysed followed by an analysis of causal relationships. The chapter concludes with a summary of the results, including the presentation of a revised model of intentions with supported hypotheses and additional relationships of significance.

5.2 Statistical methods

A variety of methods of statistical analysis were employed in the analysis of the survey data. Initial description of the components of the model was undertaken with means and standard deviations provided for interval or ratio data and frequency of occurrence provided for categorical data measured on either nominal or ordinal scales. Correlation was used to analyse relationships between interval or ratio data and chi-square was used to analyse relationships between nominal or ordinal data. Relationships between interval or ratio data and data of nominal or ordinal scale were analysed by comparing means of the interval or ratio data when grouped on the nominal or ordinal scale. The comparison between means was analysed using T-tests and ANOVA. Two methods, multiple regression and ordered logit modelling were employed to analyse causal relationships.
Multiple regression was used to analyse the relationships between external components of the model and components of the model that have a direct relationship with intention. An ordered logit model was used to analyse the relationship between components hypothesised as determinants of intention and the dependent variable intention.

5.2.1 Ordered logit modelling

While linear regression is a standard statistical method in the social sciences, ordered logit modelling is comparatively less well established. Ordered logit modelling focuses on determining the probability of a choice between discrete ordered categories from determinant variables and can therefore be used to test hypotheses of the relationship between determinant variables and an ordered categorical dependant variable. As these models are relatively new, conventions regarding model specification and interpretation are yet to be established. Specifications of the ordered logit model and methods for its interpretation are therefore provided.

5.2.1.1 Specifications of the ordered logit model

The ordered logit model, promoted by Green (1990), is based on the following specification:

\[ y^* = \beta' x + \varepsilon \]

where \( x \) is a vector of determinants; \( \beta \) is a vector of parameters to be estimated and \( y^* \) is the counterpart of \( y \) that is derived from \( x \). The estimation is made in the following manner:

\[
\begin{align*}
y &= 0 \text{ if } y^* \leq 0 \\
&= 1 \text{ if } 0 \leq y^* < \mu_1, \\
&= 2 \text{ if } \mu_1 \leq y^* < \mu_2, \\
&\vdots \\
&= J \text{ if } \mu_{j-1} \leq y^* \\
\end{align*}
\]
in which the $\mu$ s are unknown parameters to be estimated along with $\beta'$.

Since $y$ represents a discrete category, there is then no significance to the unit distance between the observed values of $y$. An iterative algorithm is used to select parameter estimates that produce the highest probability or likelihood of obtaining the observed $y$. The probabilities are derived from the following equation:

$$
P(y = 0) = F(-\beta'x)
$$

$$
P(y = 1) = F(\mu1 - \beta'x) - F(-\beta'x)
$$

$$
P(y = 2) = 1 - F(\mu2 - \beta'x) - F(\mu1 - \beta'x)
$$

$$
\vdots
$$

$$
P(y = J) = 1 - F(\mu J - 1 - \beta'x)
$$

Where $F$ is a function, which in the case of the ordered logit model is a standard logistic distribution.

5.2.1.2 Interpretation of the ordered logit model

**Number of correct predictions**

In a crosstabulation table comparing actual with predicted outcomes the diagonal elements of the table display the number of correctly predicted outcomes. The summation of these numbers produces an overall number of correct predictions. Where the number of correct predictions exceeds the number of predictions that would occur randomly they can be interpreted as being indicative of a good fit (Maddalla, 1993). There is, however, no specific requirement regarding the significance of the number of correct predictions.

**Goodness of fit**

For interpreting goodness of fit there is no immediate equivalent to $R^2$, as used in linear regression. Nevertheless, a number of pseudo $R^2$ measures have been developed. One
of the most common methods is McFadden’s $R^2$ (Hanemann & Kanninen, 1999). A shortcoming of this method is that McFadden’s $R^2$ cannot decrease when additional variables are added to an ordered logit model, thus impairing its value for comparing different models from the same data set. In such cases Hanemann and Kanninen (1999) recommend that an adjusted pseudo $R^2$ be employed, which accounts for the number of parameters in the model.

An adjusted pseudo $R^2$ proposed by Horowitz (1982, cited in Hanemann & Kanninen, 1999) is:

$$R^2 = 1 - \frac{L_{\text{max}} - K/2}{L_0}$$

Where $L_{\text{max}}$ is the unrestricted log likelihood; $L_0$ is the log likelihood where all the coefficients except for the constant are restricted to zero; and $K$ is the number of parameters in the model. McFadden’s $R^2$ is estimated using the same equation with the omission of $K/2$. A good fit is indicated for a McFadden’s $R^2$ when the result falls between 0.2 and 0.4 and an $R^2$ approaching 0.4 is considered an extremely good fit (Henster & Johnston, 1981). The same interpretation can therefore still be made for the adjusted pseudo $R^2$ given that slightly lower values can be expected. Both the McFadden’s $R^2$ and the adjusted pseudo $R^2$ are provided for the ordered logit models in this thesis.

Relative importance of independent variables

Unlike linear regression models the coefficients produced from an ordered logit model are not equal to their marginal effects. Inferring relative importance directly from these coefficients is therefore misleading. An alternative method, promoted by Green (1990), is to derive marginal effects from the probability estimates in the ordered logit model. This approach has a shortcoming as the estimation of marginal effects involves holding determinant variables at their mean. Nevertheless, given this minor limitation, marginal effects can be readily interpreted, as Green (1990) recommends, as signifying the relative importance of a determinant variable by indicating the impact that a change in the variable has on the prediction of the dependent variable. Marginal effects are
therefore utilised in this thesis as an indicator of the relative importance of determinant variables.

5.3 Results

5.3.1 Response rate
Within five weeks of posting the questionnaires, two hundred and eighty nine were returned. In addition, twelve questionnaires were returned undelivered. Of the two hundred and eighty nine questionnaires returned, twenty-three were discarded because they were incomplete. The remaining two hundred and sixty six useable questionnaires (22.39% of the questionnaires delivered) were coded for analysis. These questionnaires had useable responses for all questionnaire items (N=266).

The response rate (22.39%) is low which may be attributable to the subject matter of the questionnaire. Previous studies of attitudes towards genetic engineering have also received low response rates, a comparable example being the study by Sparks, Shepherd and Frewer (1995) which also drew a low response rate (17%). Low response rates raise the possibility of sample bias towards individuals who are either interested in, or had knowledge of the subject matter of the questionnaire. This is a concern because low response rates may limit the ability to make assertions about the intentions of the wider population. However, while Ajzen and Fishbein (1980) concede that some people may make their personal decisions in different ways, they also argue that psychological processes identified using an attitude-behaviour model apply to most people. This suggests that where an attitude-behaviour study receives a low response rate, if the findings of the study are statistically significant, it can then be argued that the thought processes identified in the sample apply to the wider population.

5.3.2 Demographic information and representativeness of the sample
To establish the representativeness of the survey, demographic information (sex, income, qualification and age) from the questionnaire was coded to enable comparison with census information of the population of Canterbury. Frequencies per category and percentages per category of the total sample (N=266) for sex, income, qualification and
age are provided in Table 5.1. In addition, percentages of the population of Canterbury per category derived from census information (Statistics New Zealand, 1997) are also provided in the table. The census information was limited to people over the age of fifteen to more closely correspond with the age of survey respondents.

Table 5.1 Demographic information

<table>
<thead>
<tr>
<th>Sex</th>
<th>Freq</th>
<th>%</th>
<th>Pop%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>171</td>
<td>64.3</td>
<td>51.5</td>
</tr>
<tr>
<td>Male</td>
<td>95</td>
<td>35.7</td>
<td>48.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Freq</th>
<th>%</th>
<th>Pop%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No qualification</td>
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<td>14.3</td>
<td>37.2</td>
</tr>
<tr>
<td>School certificate</td>
<td>27</td>
<td>10.2</td>
<td>13.3</td>
</tr>
<tr>
<td>Sixth form certificate</td>
<td>15</td>
<td>5.6</td>
<td>10.5</td>
</tr>
<tr>
<td>Higher school</td>
<td>27</td>
<td>10.1</td>
<td>6.7</td>
</tr>
<tr>
<td>Further qualifications</td>
<td>159</td>
<td>40.2</td>
<td>32.3</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Income</th>
<th>Freq</th>
<th>%</th>
<th>Pop%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $5000</td>
<td>8</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>$5001-$10000</td>
<td>38</td>
<td>14.3</td>
<td>17.4</td>
</tr>
<tr>
<td>$10001-$15000</td>
<td>45</td>
<td>16.9</td>
<td>17.2</td>
</tr>
<tr>
<td>$15001-$20000</td>
<td>29</td>
<td>10.9</td>
<td>11</td>
</tr>
<tr>
<td>$20001-$25000</td>
<td>26</td>
<td>9.8</td>
<td>9.2</td>
</tr>
<tr>
<td>$2501-$30000</td>
<td>28</td>
<td>10.5</td>
<td>8.8</td>
</tr>
<tr>
<td>$30001-$40000</td>
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<td>$40001-$50000</td>
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<td>5</td>
</tr>
<tr>
<td>$50001-$70000</td>
<td>22</td>
<td>8.3</td>
<td>3</td>
</tr>
<tr>
<td>$70000-$100000</td>
<td>4</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>$100000+</td>
<td>8</td>
<td>3</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Freq</th>
<th>%</th>
<th>Pop%</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>18</td>
<td>6.8</td>
<td>17.8</td>
</tr>
<tr>
<td>25-34</td>
<td>50</td>
<td>18.8</td>
<td>19.1</td>
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<tr>
<td>35-44</td>
<td>65</td>
<td>24.4</td>
<td>17.4</td>
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<td>45-54</td>
<td>50</td>
<td>18.8</td>
<td>19.5</td>
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<td>13.2</td>
<td>10.5</td>
</tr>
<tr>
<td>65-74</td>
<td>32</td>
<td>12</td>
<td>9.7</td>
</tr>
<tr>
<td>75+</td>
<td>16</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Chi-square tests of goodness of fit between the characteristics of respondents and frequencies derived from census information were used to test whether survey respondents were representative of the population of Canterbury. The results of these tests are provided in Table 5.2.
Table 5.2 Chi-square tests of representativeness

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>Degrees of Freedom</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>17.39</td>
<td>1</td>
<td>.0000</td>
</tr>
<tr>
<td>Income</td>
<td>80.27</td>
<td>10</td>
<td>.0000</td>
</tr>
<tr>
<td>Qualification</td>
<td>112.50</td>
<td>4</td>
<td>.0000</td>
</tr>
<tr>
<td>Age</td>
<td>29.08</td>
<td>6</td>
<td>.0001</td>
</tr>
</tbody>
</table>

As is evident from Table 5.2, in terms of sex, income, qualification and age there were significant differences ($p < .001$) between respondents and the population of Canterbury. These differences are evident in Table 5.1 with; a higher proportion of females responding (64.3%) than comprise the population (51.5%); fewer low income (< $5000) respondents (3%) compared to the population (15.8%); fewer respondents with no qualification (14.3%) compared to the population (37.2%); and a higher proportion of responses in the thirty five to forty four age group (24.4%) in comparison with the population (17.4%). Based on this analysis the sample cannot be considered to be representative of the population of Canterbury though, as argued in the previous section (section 5.3.1), the findings may still be projected onto the wider population if they are found to be statistically significant.

5.3.3 Description of model components

Frequencies for categories of intention are provided in Table 5.3. As is evident from the table, twenty-seven respondents (10%) had an intention or a strong intention to purchase food produced using genetic engineering, eighty respondents (30%) had no purchasing intentions and one hundred and fifty nine respondents (60%) had an intention or a strong intention not to purchase. Combining the intentions to purchase with those with no intention results in one hundred and seven (40%) who would not avoid purchasing the food.

Table 5.3 Intention frequencies

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Strong intention not to purchase</th>
<th>Intention not to purchase</th>
<th>No intention</th>
<th>Intention to purchase</th>
<th>Strong intention to purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>266</td>
<td>76</td>
<td>83</td>
<td>80</td>
<td>22</td>
<td>5</td>
</tr>
<tr>
<td>Percentage</td>
<td>100%</td>
<td>28.7%</td>
<td>31.3%</td>
<td>30%</td>
<td>8.2%</td>
<td>1.8%</td>
</tr>
</tbody>
</table>
Table 5.4 Means and standard deviations for model components

<table>
<thead>
<tr>
<th>Component</th>
<th>Abbreviation</th>
<th>Mean</th>
<th>Std dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude toward the behaviour</td>
<td>Attitude</td>
<td>-43.49</td>
<td>106.82</td>
</tr>
<tr>
<td>Self-identity</td>
<td>SelfID</td>
<td>-1.52</td>
<td>3.00</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>Sn</td>
<td>-2.41</td>
<td>3.97</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>PBC</td>
<td>-0.92</td>
<td>2.88</td>
</tr>
<tr>
<td>Amount of talk about purchasing the food</td>
<td>Talk</td>
<td>3.11</td>
<td>2.55</td>
</tr>
<tr>
<td>Number of newspaper articles read</td>
<td>Read</td>
<td>3.46</td>
<td>1.89</td>
</tr>
<tr>
<td>Frequency of purchase based on whether the food was produced using pesticides or herbicides</td>
<td>Pest</td>
<td>3.56</td>
<td>1.78</td>
</tr>
<tr>
<td>Frequency of purchase based on additive content</td>
<td>Addit</td>
<td>3.85</td>
<td>1.75</td>
</tr>
<tr>
<td>Shopping frequency</td>
<td>Shop</td>
<td>5.43</td>
<td>1.47</td>
</tr>
<tr>
<td>Believe statements by companies</td>
<td>Belco</td>
<td>2.65</td>
<td>1.47</td>
</tr>
<tr>
<td>Believe statements by scientists</td>
<td>Belsci</td>
<td>4.70</td>
<td>1.39</td>
</tr>
<tr>
<td>Believe statements by government agencies</td>
<td>Belga</td>
<td>3.28</td>
<td>1.44</td>
</tr>
</tbody>
</table>

Note: Range for Attitude, -339 to 441; SN, -18 to 8; PBC, -6 to 6; Self-identity, -6 to 6. Range for all other components, 1 to 7.

Means and standard deviations of the other components of the model are presented in Table 5.4. Attitude, self-identity, subjective norm and PBC were constructed as planned.

**Attitude towards the behaviour**

Attitude towards the purchase of food produced using genetic engineering ($\bar{x} = -43.49$, sd 106.82) was formed using the paired desirability and likelihood measures of eight outcomes. Fourteen paired questions about the desirability and likelihood of the consequences of the development of technology were multiplied together and then multiplied by the likelihood that purchasing the food would contribute to these consequences ($\bar{x} = 5.16$, sd 1.46). This formed the first seven attitudinal beliefs, which are listed in Table 5.5. The remaining attitudinal belief, that purchasing the food was a personal risk, was formed by multiplying together paired questions about the desirability and likelihood of this outcome, the product of which was then multiplied by seven to ensure that all attitudinal beliefs were of equal range and scale. All eight attitudinal beliefs were then summed together to produce attitude.
Table 5.5. Means and standard deviations for attitudinal beliefs

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to ecological systems</td>
<td>13.08</td>
<td>24.10</td>
</tr>
<tr>
<td>Risk to society</td>
<td>11.51</td>
<td>21.49</td>
</tr>
<tr>
<td>Profit for multinational companies</td>
<td>4.40</td>
<td>18.41</td>
</tr>
<tr>
<td>Reduced use of chemicals</td>
<td>.24</td>
<td>20.51</td>
</tr>
<tr>
<td>Better quality food</td>
<td>2.22</td>
<td>16.95</td>
</tr>
<tr>
<td>Adverse effects for future generations</td>
<td>-13.21</td>
<td>23.66</td>
</tr>
<tr>
<td>Enhanced economic growth</td>
<td>2.40</td>
<td>15.54</td>
</tr>
<tr>
<td>Personal risk</td>
<td>10.29</td>
<td>28.85</td>
</tr>
</tbody>
</table>

Note: Range = 86 to -86

Attitudinal beliefs

Mean scores and standard deviations for attitudinal beliefs are provided in Table 5.5. As is evident from the table, the means of most attitudinal beliefs were positive. The only negative mean was for the attitudinal belief that purchasing the food would result in adverse effects for future generations (\( \bar{x} = -13.21 \), sd 23.66). However, it should be noted that means and standard deviations for attitudinal beliefs do not reveal how they were combined to form an attitude score for each respondent. When each respondent’s attitudinal beliefs were summed they produced predominantly negative scores.

Desirability and likelihood

Mean scores and standard deviations for responses to the desirability and likelihood questions are presented in Table 5.6. These results show that damage to ecological systems, risks to society, adverse effects for future generations and personal risk were generally considered to be undesirable consequences and likely to occur. Unlike what was found in the focus groups, personal risk and risks to society have similar means for both desirability and likelihood. These similarities are also found in a correlation test between the desirability of personal risk and the desirability of risk to society (\( r = .43, p < .001 \)) and a correlation test between the likelihood of personal risk and risks to society (\( r = .65, p < .001 \)). Profits for multinational companies were generally considered to be
undesirable and were judged to be the most likely consequence of the development of genetic engineering for food production. Enhanced economic growth was generally considered to be desirable and a likely consequence. A reduction in the use of harmful chemicals was desirable, but not as likely to occur as the other consequences. Better quality food was desirable, but generally considered to be an unlikely consequence of using the technology in food production.

Table 5.6. Means and standard deviations for desirability and likelihood

<table>
<thead>
<tr>
<th>Desired Effect</th>
<th>Desirability</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to ecological systems</td>
<td>-2.27</td>
<td>.98</td>
</tr>
<tr>
<td>Risk to society</td>
<td>-2.04</td>
<td>.85</td>
</tr>
<tr>
<td>Profit for multinational companies</td>
<td>-0.47</td>
<td>1.54</td>
</tr>
<tr>
<td>Reduced use of chemicals</td>
<td>1.77</td>
<td>.05</td>
</tr>
<tr>
<td>Better quality food</td>
<td>1.01</td>
<td>-.20</td>
</tr>
<tr>
<td>Adverse effects for future generations</td>
<td>-2.17</td>
<td>.96</td>
</tr>
<tr>
<td>Enhanced economic growth</td>
<td>1.07</td>
<td>.17</td>
</tr>
<tr>
<td>Personal risk</td>
<td>-2.20</td>
<td>.51</td>
</tr>
</tbody>
</table>

Note: Desirability and likelihood range = -3 to 3

Subjective norm

The subjective norm ($\bar{x} -2.41$, sd 3.97) was formed by summing the perceived views of family and friends ($\bar{x} -0.94$, sd 1.07, range $-3$ to $3$) with the motivation to comply with these views ($\bar{x} 2.06$, sd 1.64, range 0 to 6). One hundred and forty five respondents (54.5%) had a negative subjective norm, indicating that they perceived family and friends to be against their purchase of the food and also indicating that he or she had some motivation to comply with these views. Only seven respondents (2.6%) had a
positive subjective norm and one hundred and eighteen respondents (44.4%) had a neutral subjective norm of zero.

**Perceived behavioural control**

PBC was formed from one question about the amount of control the respondent had over purchasing or avoiding the purchase of the food ($\bar{x} = 2.68$, sd 1.39). This measure of control refers to both control over purchasing the food and control over not purchasing the food. This dichotomy of control was incorporated by transforming control into a bipolar range anchored by complete control over not purchasing (-6) and complete control over purchasing (6) with no control at the midpoint (0). Whether the respondent’s control related to control over purchasing or not purchasing was determined by assessing whether his or her motivations were positive or negative which was determined from their attitude, subjective norm and self-identity\(^4\). This produced PBC ($\bar{x} = -0.92$, sd 2.88, range -6 to 6) which was able to be tested alongside attitude, subjective norm and self-identity with the five categories of intention.

**Self-identity**

Self-identity ($\bar{x} = -1.52$, sd 3, range -6 to 6) was formed from the summation of the two “type of person” questions. The type of person who would purchase the food ($\bar{x} = -0.62$, sd 1.67, range -3 to 3) and type of person who would not purchase the food ($\bar{x} = -0.90$, sd 1.52, range 3 to -3). The two responses, which were significantly correlated ($r = 0.91$, $p < 0.001$), were summed to produce self-identity. Fifty-one respondents (19.2%) had a positive self-identity score indicating they were the type of person who would purchase the food and one hundred and thirty eight respondents (50.9%) had a negative self-identity score indicating they were the type of person who would not purchase the food. Seventy-seven respondents (28.9%) had a zero self-identity score indicating they were neither the type of person who would purchase the food nor the type of person who would not purchase the food.

Motivation was derived by applying weights to attitude, subjective norm and self-identity, to represent their relative importance in determining intention. The weights were derived from the normalised marginal effects of these variables on the probability of choosing an intention category in an ordered logit model. The weighted components were then summed to produce a motivation score.
5.3.4 Correlation analysis

Correlations between model components measured on interval or ratio scales are provided in Table 5.7. As is evident from the table, most of the components of the model correlated significantly (p < .05 or better) with other components of the model. Model components that were expected to have a direct relationship with intention (self-identity, attitude, subjective norm and PBC) are all correlated significantly (p < .05 or better) with each other. This supports the hypothesis (H3) that these components will be interrelated. In support of the hypothesised relationship (H8) between belief in statements by companies (belco), scientists (belsci) and government agencies (belga) and other model components: attitude correlated significantly with belco (r = .39, p < .001), with belga (r = .27, p < .001) and with belsci (r = .22, p < .001); self-identity correlated significantly with belco (r = .42, p < .001), with belga (r = .28, p < .001) and with belsci (r = .20, p < .001); subjective norm correlated significantly with belco (r = .21, p < .001), with belsci (r = .22, p < .001) and with belga (r = .13, p < .05); and PBC correlated significantly with belco (r = .25, p < .001).

In support of the hypothesised relationship (H5 & H6) between the behaviours of purchasing food that contains additives (addit) or purchasing food produced with pesticides or herbicides (pest) and other model components: attitude correlated significantly with addit (r = -.48, p < .001) and with pest (r = -.47, p < .001); and self-identity correlated significantly with addit (r = -.48, p < .001) and with pest (r = -.45, p < .001). In addition, subjective norm correlated significantly with addit (r = .26, p < .001) and with pest (r = -.31, p < .001); and PBC correlated significantly with additive (r = - .34, p < .001) and with pest (r = -.35, p < .001).
Table 5.7 Correlations between components

<table>
<thead>
<tr>
<th></th>
<th>Addit</th>
<th>Age</th>
<th>Attitude</th>
<th>Belco</th>
<th>Belga</th>
<th>Belsci</th>
<th>Pest</th>
<th>PBC</th>
<th>SN</th>
<th>Read</th>
<th>SelfID</th>
<th>Talk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>-.48***</td>
<td>.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belco</td>
<td>-.26***</td>
<td>-.065</td>
<td>.39***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belga</td>
<td>-.15*</td>
<td>-.11</td>
<td>.27***</td>
<td>.46***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belsci</td>
<td>-.20***</td>
<td>-.14</td>
<td>.22***</td>
<td>.30***</td>
<td>.42***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest</td>
<td>.78***</td>
<td>.07</td>
<td>-.47***</td>
<td>-.27***</td>
<td>-.23***</td>
<td>-24**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>-.34***</td>
<td>.10</td>
<td>.44***</td>
<td>.25***</td>
<td>.10</td>
<td>.09</td>
<td>-.35***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>-.26***</td>
<td>.06</td>
<td>.39***</td>
<td>.21***</td>
<td>.22***</td>
<td>.13*</td>
<td>-.31***</td>
<td>.26***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read</td>
<td>.29***</td>
<td>.23***</td>
<td>-.02</td>
<td>-.11</td>
<td>-.04</td>
<td>-.15*</td>
<td>.29***</td>
<td>-.01</td>
<td>-.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SelfID</td>
<td>-.48***</td>
<td>.14*</td>
<td>.69***</td>
<td>.42***</td>
<td>.28***</td>
<td>.20**</td>
<td>-.45***</td>
<td>.54***</td>
<td>.32***</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk</td>
<td>.37***</td>
<td>.00</td>
<td>-.29***</td>
<td>-.23***</td>
<td>.13*</td>
<td>-.19***</td>
<td>.42***</td>
<td>-.17**</td>
<td>-.19*</td>
<td>.45***</td>
<td>-.30***</td>
<td></td>
</tr>
<tr>
<td>Shop</td>
<td>.16**</td>
<td>.10</td>
<td>-.06</td>
<td>-.07</td>
<td>.07</td>
<td>-.08</td>
<td>.08</td>
<td>.04</td>
<td>.01</td>
<td>.14*</td>
<td>-.01</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note: *p < .05, ** p < .01, ***p < .001
The amount of time spent talking about the food (talk) correlated significantly with attitude \( (r = -0.29, p < 0.001) \), providing support for the hypothesised relationship (H7) between these components. In addition, talk also significantly correlated with self-identity \( (r = -0.30, p < 0.001) \), with subjective norm \( (r = -0.19, p < 0.05) \), and with PBC \( (r = -0.17, p < 0.01) \). However, correlations were non-significant between the number of newspaper articles that had been read about the food (read) and most other components, including self-identity, attitude, subjective norm and PBC. Correlations are also non-significant between PBC and belga and between PBC and belsci. Age correlated significantly with read \( (r = 0.23, p < 0.001) \) and with self-identity \( (r = 0.14, p < 0.05) \).

5.3.5 Relationships between demographic variables and model components

Chi-square tests were conducted between intention and demographic variables. Age was tested with intention using ANOVA (Sum of sqs, 1200.184, df 4, mean sq 300.046, F-value 1.126, Sig of F 0.345) and no significant relationship was found. Tests between age and other components are provided in the correlation analysis. To conduct chi-square tests, income, qualification and intention were reduced to variables of fewer categories because chi-square tests require that the lowest expected frequency per cell from the matrix of two variables is five. Income was transformed into four categories (< $15000; $15001 to $30000; $30001 to $50000; and > $50001) and qualification was transformed into two categories, one containing no qualification, school certificate and sixth form certificate and the second containing higher school qualifications and further qualifications. Intention was reduced to four categories by including strong intentions to purchase with the intention to purchase category.

Chi-square tests using the reduced variables found that there was no significant relationship between intention and income (Chi sq 8.78, df 9, p > 0.05) and no significant relationship between intention and qualification (Chi sq 0.90, df 3, p > 0.05). A significant relationship was, however, found between intention and sex (Chi sq 16.5, df 3, p < 0.001). Indicating that, other things being equal, males are more likely to have an intention to purchase than females.
ANOVA was used to test for differences in the mean scores of self-identity, attitude, subjective norm and PBC for categories of the demographic variables. The results of this analysis are provided in Table 5.8. Income was tested using eleven categories and qualification was tested using five categories as set out in Table 5.1.

Table 5.8. ANOVA tests for equality of means for sex, income and qualification with model components

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squs</th>
<th>Df</th>
<th>Mean sq</th>
<th>F value</th>
<th>Sig of F</th>
</tr>
</thead>
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<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>83155.460</td>
<td>1</td>
<td>83155.460</td>
<td>7.465</td>
<td>.007</td>
</tr>
<tr>
<td>SelfID</td>
<td>32.010</td>
<td>1</td>
<td>32.010</td>
<td>15.563</td>
<td>.000</td>
</tr>
<tr>
<td>SN</td>
<td>25.272</td>
<td>1</td>
<td>25.272</td>
<td>1.603</td>
<td>.207</td>
</tr>
<tr>
<td>PBC</td>
<td>55.627</td>
<td>1</td>
<td>55.627</td>
<td>12.941</td>
<td>.000</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>77324.273</td>
<td>10</td>
<td>7732.427</td>
<td>.669</td>
<td>.753</td>
</tr>
<tr>
<td>SelfID</td>
<td>11.432</td>
<td>10</td>
<td>1.143</td>
<td>.517</td>
<td>.877</td>
</tr>
<tr>
<td>SN</td>
<td>81.655</td>
<td>10</td>
<td>8.165</td>
<td>.507</td>
<td>.884</td>
</tr>
<tr>
<td>PBC</td>
<td>4.102</td>
<td>10</td>
<td>4.121</td>
<td>.914</td>
<td>.520</td>
</tr>
<tr>
<td>Qualification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>28500.191</td>
<td>4</td>
<td>7125.048</td>
<td>.621</td>
<td>.648</td>
</tr>
<tr>
<td>SelfID</td>
<td>3.700</td>
<td>4</td>
<td>.925</td>
<td>.423</td>
<td>.792</td>
</tr>
<tr>
<td>SN</td>
<td>69.913</td>
<td>4</td>
<td>17.478</td>
<td>1.108</td>
<td>.353</td>
</tr>
<tr>
<td>PBC</td>
<td>3.027</td>
<td>4</td>
<td>.757</td>
<td>.166</td>
<td>.955</td>
</tr>
</tbody>
</table>

As is evident from Table 5.8, relationships between sex and self-identity (p < .001), sex and attitude (p < .01) and sex and PBC (p < .001) were found to be significant. All other relationships were not significant (p > .20). Sex is therefore included in an analysis of the effects of external variables on self-identity, attitude, subjective norm and PBC in section 5.3.7.

5.3.6 Tests for equality of means for model components between categories of intention.

Respondents' scores for self-identity, attitude, subjective norm and PBC, categorised by their intentions, are provided in Table 5.9. As is evident in the table, ANOVA tests of the probability that all means are equal indicate there were significant (Prob of F < .0001) differences between intentions based on a comparison of the self-identity, attitude, subjective norm and PBC scores. In addition, comparisons between intention categories based on their scores for self-identity, attitude, subjective norm and PBC
found significant differences (t-tests, p < 0.5) between most categories of intention. It is also evident from the table that the intention categories are ordered with respect to their values for self-identity, attitude, subjective norm and PBC. The values for the components all progressively increase between the strong intention not to purchase category and the strong intention to purchase category. This indicates that a positive relationship exists between determinant variables and intention, and provides a measure of the strength of each determinant variable for each category of intention.

Table 5.9 Analysis of intention categories

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>SelfID</th>
<th>Attitude</th>
<th>Sn</th>
<th>PBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong intention not to purchase</td>
<td>Mean</td>
<td>-4.09</td>
<td>-128.74</td>
<td>-4.16</td>
</tr>
<tr>
<td></td>
<td>Std dev</td>
<td>2.48</td>
<td>92.10</td>
<td>5.33</td>
</tr>
<tr>
<td>Intention not to purchase</td>
<td>Mean</td>
<td>-2.30</td>
<td>-59.26</td>
<td>-3.05</td>
</tr>
<tr>
<td></td>
<td>Std dev</td>
<td>1.82</td>
<td>68.34</td>
<td>3.56</td>
</tr>
<tr>
<td>No intention</td>
<td>Mean</td>
<td>.53</td>
<td>4</td>
<td>-0.88</td>
</tr>
<tr>
<td></td>
<td>Std dev</td>
<td>1.40</td>
<td>62.61</td>
<td>1.99</td>
</tr>
<tr>
<td>Intention to purchase</td>
<td>Mean</td>
<td>1.90</td>
<td>89.55</td>
<td>-0.50</td>
</tr>
<tr>
<td></td>
<td>Std dev</td>
<td>2.75</td>
<td>87.45</td>
<td>1.37</td>
</tr>
<tr>
<td>Strong intention to purchase</td>
<td>Mean</td>
<td>2.40</td>
<td>168.80</td>
<td>1.80</td>
</tr>
<tr>
<td></td>
<td>Std dev</td>
<td>4.98</td>
<td>204.05</td>
<td>3.49</td>
</tr>
<tr>
<td>Means with significant difference (t-tests, p&lt;0.5)</td>
<td>11–12,11–13, 12–14,12–13, 12–14,13–14, 12–14,13–14, 12–14,13–14, 12–14,13–14, 12–14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability that all means are equal (ANOVA, Prob of F)</td>
<td>.0000</td>
<td>.0000</td>
<td>.0000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

5.3.7 Regression analysis

Regression analysis was undertaken to investigate the relationships between external variables and the components of the model of motivations to purchase. Self-identity, attitude, subjective norm and PBC were regressed onto external variables that were identified through correlation analysis (section 5.4.1) and ANOVA (section 5.4.2) as having significant (p < .05 or better) relationships with these components.

The result of the regression analysis for self-identity is provided in Table 5.10. As is evident from the table, significant (p < .05) independent effects were found for; additive, age, belco and sex. This analysis reveals that the type of person who would not purchase
food produced using genetic engineering already purchases food based on their beliefs about whether or not the food contains additives. The type of person who would purchase the food tends to be older than those who would not purchase and more men are the type of person who would purchase than women. In addition, the type of person who would purchase the food is more likely to believe statements by a company engaged in the development of the food.

Table 5.10. Regression on self-identity

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>T</th>
<th>Sig T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive</td>
<td>-0.459</td>
<td>-3.432</td>
<td>.0007</td>
</tr>
<tr>
<td>Age</td>
<td>0.032</td>
<td>3.562</td>
<td>.0004</td>
</tr>
<tr>
<td>Belco</td>
<td>0.546</td>
<td>4.746</td>
<td>.0000</td>
</tr>
<tr>
<td>Belga</td>
<td>0.189</td>
<td>1.560</td>
<td>.1199</td>
</tr>
<tr>
<td>Belsci</td>
<td>0.061</td>
<td>.520</td>
<td>.6001</td>
</tr>
<tr>
<td>Pest</td>
<td>-0.184</td>
<td>-1.367</td>
<td>.1727</td>
</tr>
<tr>
<td>Talk</td>
<td>-0.104</td>
<td>-1.391</td>
<td>.1600</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.748</td>
<td>-2.364</td>
<td>.0188</td>
</tr>
</tbody>
</table>

The results of the regression analysis for attitude are provided in Table 5.11. Significant (p < .05) independent effects were found for additive and beleo,. In addition, a marginally significant (p < .06) independent effect was found for pest. Some significance (p < .08) for an independent effect was also found for sex. This analysis reveals that respondents who do not purchase food based on beliefs about whether or not the food contains additives and possibly also do not purchase food based on beliefs...
about whether pesticides or herbicides were used in their production tend to have positive attitudes towards purchasing food produced using genetic engineering. In addition, positive attitudes are associated with the likelihood that the respondent would believe statements by a company engaged in the development of food produced using genetic engineering. It is also possible that males tend to have more positive attitudes than females.

The result of the regression analysis for subjective norm is provided in Table 5.12. As is evident from the table, a significant (p < .05) independent effect was found for pest. In addition, some significance (p < .08) was found for an independent effect of belga on subjective norm. This indicates that people who do not purchase food based on the belief that pesticides or herbicides were used in its production do not believe that family and friends oppose the purchase of food produced using genetic engineering. It is also possible that believing statements made by government agencies has a positive effect on their subjective norm.

Table 5.12 Regression on subjective norm

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>T</th>
<th>Sig T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive</td>
<td>-.0877</td>
<td>-.416</td>
<td>.6776</td>
</tr>
<tr>
<td>Belco</td>
<td>.2137</td>
<td>1.168</td>
<td>.2439</td>
</tr>
<tr>
<td>Belga</td>
<td>.3490</td>
<td>1.809</td>
<td>.0715</td>
</tr>
<tr>
<td>Belsci</td>
<td>-.0495</td>
<td>-.265</td>
<td>.7914</td>
</tr>
<tr>
<td>Pest</td>
<td>-.4727</td>
<td>-.202</td>
<td>.0287</td>
</tr>
<tr>
<td>Talk</td>
<td>-.1049</td>
<td>-.876</td>
<td>.3818</td>
</tr>
</tbody>
</table>

Table 5.13 Regression on PBC

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>T</th>
<th>Sig T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive</td>
<td>-.1658</td>
<td>-1.517</td>
<td>.1305</td>
</tr>
<tr>
<td>Belco</td>
<td>.2478</td>
<td>2.907</td>
<td>.0040</td>
</tr>
<tr>
<td>Pest</td>
<td>-.2036</td>
<td>-1.860</td>
<td>.0640</td>
</tr>
<tr>
<td>Talk</td>
<td>.0070</td>
<td>.115</td>
<td>.9082</td>
</tr>
<tr>
<td>Sex</td>
<td>.7398</td>
<td>2.924</td>
<td>.0038</td>
</tr>
</tbody>
</table>
The results of the regression analysis for PBC are provided in Table 5.13. As is evident from the table, significant (p < .05) independent effects were found for belco and sex. Some significance (p < .07) was found for an independent effect for Pest. This indicates that people who believe statements by companies perceive they have more control over purchasing the food. In addition, men perceive they have more control over purchasing than women, who tend to have more perceived control over not purchasing the food. It is also possible that people who do not purchase food based on the belief that pesticides of herbicides were used in its production have more perceived control over purchasing food produced using genetic engineering.

5.3.8 Ordered logit analysis

Ordered logit modelling was undertaken to investigate the relationship between intention and model components hypothesised to form intention (H1) and to investigate the hypothesised independent effect of these components on intention (H2). In addition, comparisons are made between with the TRA and the TPB and the model of motivations to purchase food produced using genetic engineering.

Table 5.14 presents the results of the analysis of three ordered logit models. The three models are the TRA, the TPB and the motivations to purchase model. All three models were of good fit with McFadden's $R^2$ and the adjusted pseudo $R^2$ values between 0.2 and 0.4, with higher $R^2$ for the motivations to purchase model indicating a better fit than the others. Consistent with the $R^2$ measure of goodness of fit the TRA correctly predicted one hundred and forty eight responses (55.6%), the TPB correctly predicted one hundred and fifty five responses (58.3%) and the motivation model correctly predicted one hundred and sixty six responses (63.1%). Proportions of correct predictions between reported intentions and predicted intentions are provided in Table 5.15. From this table it is evident that the motivations to purchase model improves on the TPB in the prediction of reported intentions for three categories, with one less predicted for intention not to purchase and strong intention to purchase remaining the same.
Table 5.14 Ordered logit results

Summary information

<table>
<thead>
<tr>
<th></th>
<th>Motivations to purchase</th>
<th>TPB</th>
<th>TRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations</td>
<td>266</td>
<td>266</td>
<td>266</td>
</tr>
<tr>
<td>Correct predictions</td>
<td>63.1%</td>
<td>58.2%</td>
<td>55.6%</td>
</tr>
<tr>
<td>Log likelihood function</td>
<td>-236.23</td>
<td>-259.60</td>
<td>-274.05</td>
</tr>
<tr>
<td>Restricted log likelihood</td>
<td>-362.70</td>
<td>-362.70</td>
<td>-362.70</td>
</tr>
<tr>
<td>McFadden's R²</td>
<td>0.35</td>
<td>0.28</td>
<td>0.24</td>
</tr>
<tr>
<td>Adjusted pseudo R²</td>
<td>0.34</td>
<td>0.28</td>
<td>0.24</td>
</tr>
<tr>
<td>Chi-squared</td>
<td>251.6</td>
<td>206.2</td>
<td>177.29</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Significance level</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Coefficients and T-scores for model components

<table>
<thead>
<tr>
<th></th>
<th>Motivations to purchase</th>
<th>TPB</th>
<th>TRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>β</td>
<td>.920</td>
<td>.149</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>4.666***</td>
<td>8.764***</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>β</td>
<td>.657</td>
<td>.749</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>1.781*</td>
<td>1.985**</td>
</tr>
<tr>
<td>PBC</td>
<td>β</td>
<td>.243</td>
<td>.369</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>2.624**</td>
<td>4.847***</td>
</tr>
<tr>
<td>SelfID</td>
<td>β</td>
<td>.449</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>7.153***</td>
<td></td>
</tr>
<tr>
<td>Mu(1)</td>
<td>β</td>
<td>2.574</td>
<td>2.190</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>10.111***</td>
<td>10.133***</td>
</tr>
<tr>
<td>Mu(2)</td>
<td>β</td>
<td>6.003</td>
<td>5.312</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>14.537***</td>
<td>13.465***</td>
</tr>
<tr>
<td>Mu(3)</td>
<td>β</td>
<td>8.885</td>
<td>7.988</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>13.350***</td>
<td>12.190***</td>
</tr>
</tbody>
</table>

Note: Sig of T: ***p < .001, **p < .05, *p < .09

A more detailed comparison between reported intentions and those predicted per category for the motivations to purchase model is provided in Table 5.16. From this table it is evident that, in addition to predicting one hundred and sixty six (63.1%) of the reported intentions, two hundred and fifty four (95.8%) were predicted within one category of the reported intention.
Table 5.15 Reported and predicted intentions

<table>
<thead>
<tr>
<th>Correctly predicted intentions</th>
<th>Reported intentions</th>
<th>Motivations to purchase</th>
<th>TPB</th>
<th>TRA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strong intention</td>
<td>52 (68.4%)</td>
<td>46 (60.5%)</td>
<td>46 (60.5%)</td>
</tr>
<tr>
<td>not to purchase</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention not to purchase</td>
<td>83</td>
<td>49 (59%)</td>
<td>50 (60.2%)</td>
<td>39 (47%)</td>
</tr>
<tr>
<td>No intention</td>
<td>80</td>
<td>57 (71.3%)</td>
<td>52 (65%)</td>
<td>55 (68.5%)</td>
</tr>
<tr>
<td>Intention to purchase</td>
<td>22</td>
<td>7 (31.4%)</td>
<td>5 (22.7%)</td>
<td>6 (27.2%)</td>
</tr>
<tr>
<td>Strong intention to purchase</td>
<td>5</td>
<td>3 (60%)</td>
<td>2 (40%)</td>
<td>2 (40%)</td>
</tr>
<tr>
<td>Total</td>
<td>266</td>
<td>168 (63.1%)</td>
<td>155 (58.3%)</td>
<td>148 (55.6%)</td>
</tr>
</tbody>
</table>

Note: Percentages in parentheses are the proportion of correct predictions per category of intention.

Table 5.16 Reported and predicted intentions for the motivations to purchase model

<table>
<thead>
<tr>
<th>Predicted intentions</th>
<th>Strong intention not to purchase</th>
<th>Intention not to purchase</th>
<th>No intention</th>
<th>Intention to purchase</th>
<th>Strong intention to purchase</th>
<th>Total reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported intentions</td>
<td>Strong intention not to purchase</td>
<td>52</td>
<td>17</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intention not to purchase</td>
<td>20</td>
<td>49</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No intention</td>
<td>0</td>
<td>19</td>
<td>57</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intention to purchase</td>
<td>0</td>
<td>2</td>
<td>13</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Strong intention to purchase</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Examination of the results of the ordered logit model shows that the independent variables of the motivation to purchase model have a significant (McFadden's $R^2 = .35$, adjusted pseudo $R^2 = .34$) relationship with intention. This finding supports the hypothesis (H1) that intention is formed from a combination of self-identity, attitude, subjective norm and PBC. In addition, it is evident that the model is an improvement on the TPB and the TRA in terms of goodness of fit. A measure of the independent significance of each determinant on intention is provided through significance of $T$
scores. From this measure it is evident that almost all components in the three models have a significant (Sig of T, \( p < .05 \) or better) independent effect on intention with subjective norm having a lower level of significance (Sig of T, \( p < .09 \)) for its independent effect on intention in the motivation model. This finding supports the hypothesis (H2) that self-identity, attitude, subjective norm and PBC will each have a significant independent effect on intention.

To further investigate the independent effects of model components on intention in the motivation model the marginal effects of a one-unit change in self-identity, attitude, subjective norm and PBC on the probability of a person choosing an intention category are provided in Table 5.17. As the units of measurement vary between these components a change in intention given a ten-percent shift in a component is provided in parentheses. A change in attitude has the greatest impact on intention. A ten-percent increase in attitude reduces the probability of having a strong intention not to purchase (by 10.8 \%) and increases the probability of having an intention to purchase (by 1\%). The biggest impact is an increase in the probability of no intention (19.15\%) from a ten-percent increase in attitude. A change in subjective norm has the lowest impact on the probability of a person choosing each of the intention categories. A ten-percent increase in PBC, which is related to the perceived ease or difficulty of purchasing the food, reduces the likelihood of a strong intention not to purchase (by 3.3\%) and has little effect on the likelihood that a person intends to purchase (increases by .44\%).

Table 5.17 Marginal effects for the motivation model

<table>
<thead>
<tr>
<th>Component</th>
<th>Strong intention not to purchase</th>
<th>Intention not to purchase</th>
<th>No intention</th>
<th>Intention to purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>SelfID</td>
<td>-.0509 (-.0610)</td>
<td>-.0497 (-.0596)</td>
<td>.0934 (.1120)</td>
<td>.0068 (.0081)</td>
</tr>
<tr>
<td>Attitude</td>
<td>-.0010 (-.1008)</td>
<td>-.0010 (-.1008)</td>
<td>.0019 (.1915)</td>
<td>.0001 (.0100)</td>
</tr>
<tr>
<td>SN</td>
<td>-.0074 (-.0266)</td>
<td>-.0073 (-.0262)</td>
<td>.0136 (.0489)</td>
<td>.0010 (.0036)</td>
</tr>
<tr>
<td>PBC</td>
<td>-.0275 (-.0330)</td>
<td>-.0268 (-.0321)</td>
<td>.0505 (.0600)</td>
<td>.0037 (.0044)</td>
</tr>
</tbody>
</table>

Note: 1. As the scales of the determinant variables differ, a change in the marginal effect given a 10% change in a determinant variable (in parentheses) is provided as an indicator of the relative importance of determinant variables.
2. Marginal effects were unable to be calculated for the strong intention to purchase category because of the limited number of responses.
**Self-identity as a single determinant**

Due to the strength of self-identity in the motivation model an ordered logit model was undertaken with self-identity as a single determinant of intention. This model found that self-identity correctly predicted 62.4% of reported intentions, which is comparable to predictions of the motivation model (63.1%), though goodness of fit was poorer (McFadden’s $R^2 = .26$, adjusted pseudo $R^2 = .26$) than the motivation model (McFadden’s $R^2 = .35$, adjusted pseudo $R^2 = .34$). While this analysis reveals that self-identity is an important single predictor of intention, the utility of predicting intentions from self-identity is, however, limited because determinants identified in the motivation model as important predictors of intention are not being taken into account.

**5.4 Summary of results**

A revised model of the motivations to purchase food produced using genetic engineering is provided in Figure 5.1. The revised model presents the components (self-identity, attitude, subjective norm and PBC) that were found to be important determinants of intention. In addition, external variables that were found to have significant associations with these components are also provided. To further explain the model, hypothesised relationships are considered and additional observations arising from the statistical analysis are identified.

The hypothesised relationship between determinants of intention and intention (H1) was supported by the findings of the ordered logit model. In combination; self-identity, attitude, subjective norm and PBC correctly predicted 63.1% of reported intentions and also predicted intention within one category of reported intentions with an accuracy of 95.8%. The model was also found to be a good fit (McFadden’s $R^2 = .35$, adjusted pseudo $R^2 = .34$) and an improvement in terms number of correct predictions of goodness of fit on the TPB (predicted 58.2%, McFadden’s $R^2 = .28$, adjusted pseudo $R^2 = .28$) and the TRA (predicted 55.6%, McFadden’s $R^2 = .24$, adjusted pseudo $R^2 = .24$).

The ordered logit model also supported the hypothesis (H2) that self-identity, attitude, subjective norm and PBC would have independent effects on intention through the
interpretation of the significance of T-scores. In addition, significant differences were found between means for each component by intention category in preliminary tests using ANOVA \((p < 0.001)\) and for most comparisons using T tests \((p < 0.05)\) (see section 5.5.3). In terms of relative importance, the marginal effects (Table 5.17) reveal that the greatest impact on intention occurs from a change in attitude (10% shift \(\rightarrow 0.2268\) to \(0.0216\) change in intention) followed by self-identity (10% shift \(\rightarrow 0.1250\) to \(0.0095\) change in intention), PBC (10% shift \(\rightarrow 0.0647\) to \(0.0049\) change in intention) and subjective norm (10% shift \(\rightarrow 0.0464\) to \(0.0036\) change in intention).

![Figure 5](attachment:figure5.png)

**Figure 5** A revised model of the motivations to purchase food produced using genetic engineering

Note: Dotted lines indicate relationships of marginal significance \((0.05 < p < 0.08)\) in regression analysis

The hypothesis (H3) that self-identity, attitude, subjective norm and PBC would be interrelated was supported by the correlation analysis and also by tests for the equality of means for these components by category of intention. The correlation analysis found that all of these components were significantly correlated \((p < 0.05\) or better) with each other. In addition, further support for the hypothesis can be found in the comparison of means of these components by category of intention, with the values for each of these components all progressively increasing in relation to the five categories of intention.
The hypothesis (H4) that there will be a significant relationship between self-identity and attitude was also supported with a significant strong correlation between these components ($r = .69, p < .001$).

The hypothesis (H5) that the components of past behaviour would be significantly associated with self-identity was only partially supported. Regression analysis found that purchasing foods based on their beliefs about whether the food contained additives was significantly associated with self-identity ($\beta = -.46, p < .001$). The hypothesised association between the past behaviour of purchasing foods based on beliefs about whether or not pesticides or herbicides were used in their production and self-identity was, however, non significant ($p > .18$). Similar findings were found between past behaviours and attitude, with the hypothesis (H6) also being only partially supported. Purchasing foods based on their beliefs about whether the food contained additives was significantly associated with attitude ($\beta = -.24, p < .01$), whereas the association between purchasing foods based on beliefs about whether or not pesticides or herbicides were used in their production and attitude was only marginally significant ($\beta = -.16, p < .06$).

The regression analysis also found only partial support for the hypothesis (H8) that the belief in statements by government agencies, university scientists and companies would each be significantly associated with attitude. Only the likelihood that one believes in the statements by companies of the benefits and risks of producing food using genetic engineering was found to be significantly associated with attitude ($\beta = -.24, p < .001$).

No support was found for the hypothesis (H7) that the components of elaboration would be significantly associated with attitude in the regression analysis.

A number of additional significant associations ($p < .05$ or better) were identified between external components and components that are determinants of intention that were not hypothesised. First, age ($\beta = .03, p < .001$) and sex ($\beta = .75, p < .05$) were found to have significant associations with self-identity. Second, the association between the past behaviour of purchasing food based on beliefs about whether or not
herbicides or pesticides were used in their production and attitude was found to be significantly associated ($\beta = -0.47$, $p < 0.05$) with subjective norm. Third, sex ($\beta = 0.74$, $p < 0.01$) and the believability of statements made by companies ($\beta = 0.25$, $p < 0.01$) were found to have significant associations with PBC. In addition some significance was found for associations between attitude and sex ($\beta = 0.09$, $p < 0.08$), the believability of statements made by government agencies and subjective norm ($\beta = 0.35$, $p < 0.08$) and between pest and PBC ($\beta = -0.20$, $p < 0.07$).

It is also evident that each determinant of intention is unique in terms of both combination and strength of association with external components. Self-identity, attitude, subjective norm and PBC can therefore be differentiated in terms of their association, or lack of association, with external variables. This promotes a fuller understanding of these components and provides a basis for arguing for the extension of the TPB to include self-identity for the study of intentions to purchase food produced using genetic engineering, as this modification enables a fuller understanding to be gained of the reasons behind intentions for this behaviour.

The statistical analysis has supported a number of hypothesised relationships posed in this thesis and has also identified a number of additional relationships. These relationships are discussed in chapter six and their practical and theoretical implications are identified followed by the main conclusions of this thesis.
Chapter six
Discussion, implications and conclusions

6.1 Introduction

This chapter discusses the results of the statistical analysis, identifies theoretical implications and provides practical implications in terms of prospects for changes in intentions. The chapter closes with summary conclusions and recommendations.

6.2 Discussion of results

The statistical analysis reveals that intentions regarding the purchase of food produced using genetic engineering are positively influenced by all four of the proposed determinants of intention. In keeping with previous studies (Biddle et al., 1987; Charnig et al., 1988; Granberg & Holmberg, 1990; Sparks & Shepherd, 1992; Sparks et al., 1995) a positive sense of self-identity was associated with positive intentions. A similar influence was found for attitude and subjective norm, which is also consistent with previous studies (e.g. Sheppard et al., 1988). In addition, as hypothesised by Ajzen (1991), an increase in PBC is associated with stronger intentions, which in this case relates to either purchasing or not purchasing the food. A number of external components were also hypothesised as influencing the determinants of intention. The statistical analysis supported some of these hypothesised relationships and a number of further relationships were identified. These relationships are important as they reveal how external components affect intention and they are also useful for providing further understanding of the determinants of intention. These relationships are discussed with further assessment of the revised model.

Intentions are posed as a determinant of behaviour because they have been found to have correspondence with behaviour (e.g. Sheppard et al., 1988). It can therefore be assumed that intentions to purchase, or not purchase food produced using genetic engineering will be indicative of whether or not the food will be purchased. This thesis, however, measured intentions in a different manner from that which has traditionally
been employed. Measuring intentions as categories is arguably more analogous with the use of the term, intention, than measuring the likelihood of intending to undertake a behaviour, which is recommended by Ajzen and Fishbein (1980). This new form of measurement was facilitated by the development of methods for analysing models with categorical dependent variables. Judgement of the effectiveness of this new measurement of intention is limited because no direct comparison is made with the traditional method. The ordered logit model did, however, produce results that are similar to those derived in studies using linear regression, with overall significance of the model being established and interpretation made of the significance and relative importance of each determinant.

A difference associated with the use of a categorical dependent variable is the study of more than one intention from the same determinants. Intentions derived from the likelihood scale, recommended by Ajzen and Fishbein (1980), only apply to an intention to perform a behaviour and do not apply to intentions not to perform a behaviour, which is regarded as a separate consideration. In this thesis the model of motivations to purchase incorporated three categories of intention with two additional categories for stronger intentions. Using this model and employing ordered logit analysis enabled a range of intentions to be studied, whereas contemporary attitude-behaviour models using cardinal measures have been limited to the consideration of the likelihood of a single intention.

Self-identity was found to be an important determinant of intention. Its inclusion added to the predictive power of the ordered logit model and produced a model of better fit than the TRA or the TPB. Self-identity was also found to have an influence on intention second only to attitude. The addition of self-identity to a TPB model was not a new proposal, as a number of studies have previously tested self-identity in this framework (Biddle et al., 1987; Charnig et al., 1988; Granberg & Holmberg, 1990; Sparks & Shepherd, 1992; Sparks et al., 1995). This thesis adds weight to these earlier studies by also finding self-identity to be a significant determinant of intention. In addition, consideration of the associations between external components and self-identity provides further understanding of this component. Older people and males tend to have
a sense of self-identity that is found in people who intend to purchase food produced using genetic engineering. Those with this sense of self-identity are also more likely to believe statements about the benefits and risks of the food and it is unlikely that they presently purchase food based on their beliefs about whether or not additives are contained in the food. Conversely, females and younger people tend to have a sense of self-identity that is found in those who intend not to purchase the food. These people are less likely to believe statements by companies and more often choose food based on their beliefs about whether or not additives are contained in the food.

Self-identity was the only determinant of intention associated with age. The effect of age on the formation of intention would not be apparent without this component. In addition, self-identity can also be distinguished from other determinants of intention because it is more strongly associated with its external components.

Positive attitudes are associated with a sense of self-identity that favours purchasing the food and negative attitudes being associated with a sense of self-identity that opposes purchasing the food. While being interrelated, the two components are separate aspects of the motivations that determine intentions. Self-identity enhanced the prediction of intentions in the ordered logit model, indicating that self-identity contains motivational factors that are not found in the other determinants. Exactly what constitutes self-identity is largely undetermined. Sparks and Shepherd (1992) argue that self-identity comprises affective reactions and possibly personal morals for which the evaluations that form attitude provide limited representation. This remains a possibility and is supported by the findings of Fazio and associates (summarised by Fazio, 1986) that attitudes formed from conscious cognitive considerations may not necessarily fully represent affective reactions. In addition, there is evidence that for some behaviours personal morals have a significant independent effect on intention (Schwartz & Tessler, 1972; Zukerman & Reis, 1978; Gorsuch & Ortberg, 1983; Biddle et al., 1987; Beck & Ajzen, 1991; Parker et al., 1995).

Attitude was formed as recommended by Ajzen and Fishbein (1980) from the sum of salient attitudinal beliefs. In undertaking the survey in this thesis it was, however, found
necessary to employ a variation on the formation of these beliefs to remove potential ambiguity from survey questions. Evaluations of the use of genetic engineering in food production were initially sought, rather than directly seeking evaluations regarding the consequences of purchasing the food. Attitude was found to be the most important determinant of intention, indicating that evaluations of the likelihood and desirability of the eight attitudinal beliefs, formed using the variation on Ajzen and Fishbein's (1980) design, substantially captured the motivations that underlie intentions. The importance of attitude in determining intention and the function of attitude in the model was therefore in keeping with previous empirical research (e.g., Sheppard et al., 1988).

Attitude was associated with the likelihood that a person believes statements by companies about the benefits and risks of the food and whether a person presently purchases food based on his or her beliefs about whether or not additives are contained in the food. An association with beliefs about additives was also found for self-identity, but only attitude was associated with whether a person purchased food based on beliefs about whether herbicides or pesticides were used in their production. This was unexpected because past behaviour has previously been identified as having stronger associations with self-identity than attitude (Sparks & Shepherd, 1992). An explanation for this is found in the consequences that were evaluated to form attitude. Many of these consequences are associated with health and environmental concerns that may well be important in the formation of attitudes towards the purchase of food containing additives, or food produced using pesticides or herbicides. Therefore, it is possible that evaluations, which are presently employed in decisions to purchase food that contains additives or food produced using pesticides or herbicides, are being used in the formation of intentions regarding the purchase of food produced using genetic engineering. These pre-existing evaluations could then act as a heuristic which is utilised instead of considering, on its own merits, the purchase of food produced using genetic engineering. The present findings establish the existence of this potential relationship, which invites further investigation to understand more fully the nature of these attitudes.
Subjective norm was less prominent in determining intention than other components. Subjective norm, nevertheless, contributed to the formation of intention and was positively associated with intention. The past behaviour of purchasing food based on beliefs about whether or not herbicides or pesticides were used in their production was associated with subjective norm. This was unexpected, though it is possible that those motivated to comply with the views of family and friends, presently engage in behaviour that they perceive to be supported by the views of others. Therefore, as proposed for the relationship between past behaviour and evaluations of the consequences that form attitude, motivations to comply with the perceived views of others regarding past behaviour is possibly being translated to intentions to purchase food produced using genetic engineering. There is also some possibility that the believability of statements by government agencies has a positive effect on subjective norm, which is plausible if the positive views of others are reinforced by positive statements by government agencies. The effect of these associations on intention is, however, minimal because of the small impact that a change in subjective norm has on intention.

PBC was a more substantive determinant of intention than subjective norm and was related to the perceived ease or difficulty of purchasing the food. The impediment of not being able to identify foods that have been produced using genetic engineering is then likely to be an important factor in determining PBC and intentions. Sex was found to be a determinant of PBC with males more likely to feel in control over purchasing the food than females. Females were more likely to feel in control of not purchasing the food. Perceptions of control were also associated with the believability of statements about the benefits and risks of purchasing the food made by companies that produce the food. In addition, there is some possibility that more control is associated with less time spent purchasing food based on beliefs about whether pesticides or herbicides were used in its production.

6.3 Theoretical implications

This thesis has employed methods established by Ajzen and Fishbein (1980) and Ajzen (1991) to understand the motivations and intentions regarding the purchase of food
produced using genetic engineering. An important theoretical outcome was that the TRA, TPB and a modified TPB, with the addition of self-identity, have been successful in understanding these motivations and intentions. Having found that these models operate as expected, this thesis therefore indicates that further studies using these research methods will be useful for understanding the motivations and intentions regarding the purchase of these foods.

In addition to demonstrating that an attitude-behaviour model performed as expected, a number of further implications have also arisen. While it had been the intention to apply an attitude-behaviour model in keeping with empirically proven models, some departures from these contemporary models were necessary. For brevity, the subjective norm only referred to family and friends and PBC was limited to a single direct inquiry of perceived control. These modifications do not appear to have significantly altered the performance of the model. Attitude was the strongest determinant of intention followed by self-identity, PBC and subjective norm, with all determinants having a positive relationship with intention as found in previous studies using a modified TPB model with the addition of self-identity (eg. Sparks and Shepherd, 1992; Sparks et al., 1995). Further studies may, however, wish to enhance the understanding of subjective norm by ascertaining the importance of the views of a wider range of peer groups, as recommended by Ajzen and Fishbein (1980). In addition, forming PBC in accordance with Ajzen (1991) from a measure of the perceived ease or difficulty of performing the behaviour and a measure of personal ability may well improve the performance of this component in the model.

A further alteration was the modification of evaluations of the consequences of performing the behaviour. To remove the possibility of ambiguity from survey questions, evaluations of the desirability and likelihood of most consequences were initially sought with reference to their being consequences of the use of genetic engineering in food production. This modification is contrary to Ajzen and Fishbein's (1980) recommendation that consequences be directly related to the performance of a behaviour, which in this case was the purchase of food produced using genetic engineering. Judging by the strength of attitude in the results, however, attitude derived
in this novel way functioned as expected in the model having a positive relationship with intention and being the most important factor in predicting behaviour. Consequences associated with a target object have been identified as important in forming an attitude towards a behaviour, thus providing empirical evidence of the link between attitudes towards targets and attitudes towards behaviours, as proposed by Eagly and Chaiken (1993).

Consideration of the evaluation of consequences also raises another theoretical implication. Altruism has been generally regarded as a poor predictor of intentions, whereas attitudes towards the personal consequences of performing a behaviour are usually better predictors of intention and behaviour (Unger, 1993). In this case, however, consequences of importance included risks to the environment, future generations and the public, which indicates that altruism was prominent in determining attitudes and intentions. The possibility that over time these altruistic concerns will be replaced by consequences of personal importance, such as consumer benefits, indicates that studies of this transition could be fruitful for understanding the replacement of altruistic concerns by more egocentric interests.

A further outcome is that risk and uncertainty are salient in evaluations of the consequences of purchasing the food. Consequences of importance to the individual are assumed to be well known by respondents in attitude-behaviour studies (Ajzen & Fishbein, 1980). In this case, however, all of the consequences are presently little more than remote prospects, which, while debated in the popular media, have at best only a small evidential basis. Evaluation of the consequences could then be readily considered to be a form of risk assessment incorporating the likelihood of a consequence occurring and its expected magnitude. Risk perception is a field of research that has already been identified as being valuable for studying reactions to genetic engineering (Frewer, Howard, Hedderley & Shepherd, 1998). This thesis has therefore found a link between attitude-behaviour research and risk perception studies and has provided direction for further research, which by combining the two approaches could possibly broaden our understanding of the attitude-behaviour relationship.
6.4 Prospects for change and policy implications

The findings of this thesis provide a static view of intentions regarding the purchase of food produced using genetic engineering. These findings, nevertheless, form a basis upon which projections of changes in intentions may be considered. Immediate prospects for change come through a change in attitude, through revision of evaluations of the desirability or likelihood of perceived consequences of performing the behaviour. In addition, further consequences of importance to the individual may arise and therefore alter attitudes towards purchasing the food. It is also conceivable that, while it is unlikely that a person's sense of self-identity will alter in the short term, the relationship between food produced using genetic engineering and this sense of self-identity would alter with a change in perceptions of this behaviour. A change in these perceptions would occur with a change in evaluations of the consequences of performing the behaviour and also if feelings about purchasing the food changed, or if moral or ethical imperatives no longer applied. Perceived control over purchasing will increase if it becomes easier to identify the foods. In addition, changes in the perceived views of family and friends or motivations to comply with their views will affect intentions, though these changes will have to be substantial to have a noticeable impact on intention.

If undesirable consequences of purchasing the food do not eventuate and desirable consequences are realised, attitude and intentions will become more positive. In addition, the performance of a behaviour will also have an impact on attitudes and intentions, because when behaviours become more familiar they also tend to become more readily accepted (Petty, Unnava & Strathman, 1991). Further desirable consequences, such as reduced prices or, as indicated by focus group participants, improved shelf life of these foods, may also positively affect attitudes and intentions. Increased profits for multinational companies are, however, undesirable and will moderate the effects of improved sales of the food brought about by positive intentions and attitudes. Conversely, attitude will be negatively affected through changes in a broad range of consequences. Evidence that increases the likelihood of risks to public health, adverse effects on future generations and damage to ecological systems will
produce negative attitudes and intentions. In addition, desirable consequences including better quality food, economic growth and a reduction in the use of harmful chemicals, if not realised will be evaluated as more unlikely overtime and result in reduced attitude scores.

An increase in PBC can be readily foreseen with the announcement by ANZFA (1999) of the development of new regulations for labelling food produced using genetic engineering. Food produced using genetic engineering should therefore be easier to identify, resulting in more personal control over purchasing. Increased PBC will affect intentions by increasing the likelihood of intentions to purchase and intentions not to purchase for those who are already motivated towards these intentions. However, for those who are not motivated to either purchase or not purchase the food simply providing the means to act on their intentions will not in itself result in the formation of a positive or negative intention. These people must first have an attitude, sense of self-identity or subjective norm, which leads them to form an intention to purchase or not purchase the food.

Having identified beliefs that are salient in forming intentions to purchase food produced using genetic engineering and a number of other important influences on intentions and the direct determinants of intentions, inducing a change in these beliefs and these important influences is expected to alter intentions. Ajzen and Fishbein (1980) stress that the ability to understand behaviour to the extent that behaviour can be changed is an important feature of attitude-behaviour modelling. In modelling intentions to purchase food produced using genetic engineering, information has been derived which would be useful for those who wish to promote the purchase of the food and also for those who wish to encourage people not to purchase the food. For example, information that emphasises that harmful consequences are of lower magnitude and are less likely than people normally believe will produce a more positive attitude. In addition, as uncertainty causes harmful consequences to be judged more likely (Otway

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\(^6\) On 22 October 1999 Australian and New Zealand Health Ministers stated their position that all genetically modified food be labelled. The Ministers agreed to delay final implementation of labelling regulations pending further public consultation and additional information on implementation, which is presently in progress.
reducing the perception of uncertainty will also have a positive effect on attitude. Attitude towards purchasing would also improve with evidence that the perceived benefits of better quality food, a reduction in the use of harmful chemicals and economic growth would be realised. Convincing the public that increased profits for multi-national companies is desirable or unlikely would also advantage companies that promote the food. In addition, where the views of the public are found to be against purchasing the food, emphasising the importance of individuals making their own decisions will promote positive intentions towards purchasing.

To be initially effective in maintaining and encouraging positive intentions, a likely tactic for promoters of the food would be to direct their promotions towards men and older age groups. These promotions may also emphasise that purchasing the food is not associated with purchasing food that contains additives or food that was produced using herbicides and pesticides. This emphasis would encourage the food to be evaluated on its own merits rather than it simply being evaluated as being a risk to the environment or human health. However, while companies involved in the production of foods produced using genetic engineering are likely to be active in promoting their products, they must also address scepticism from those who intend not to purchase the food. To gain credibility the companies must appear open and honest and possibly even concede there are risks and uncertainty involved in using the technology in order to advance their cause. This concession presents a dilemma for producers of the food who must avoid appearing unduly persuasive while defending and promoting their products. The use of a two-sided argument, however, could be useful as it is evident that providing the public with an opposing view and then refuting it provides the public with a ready argument against the opposing view (Petty, Unnava & Strathman, 1991). For example, conceding that there are risks involved in producing food using genetic engineering and then explaining that these risks are well known and manageable should be beneficial in promoting the purchase of the food by countering a possible argument promoted by those opposed to use of the technology.

An effective tactic for encouraging negative attitudes towards purchasing the food would be to emphasise greater magnitude and likelihood of harmful consequences. In
promoting the antithesis of the proponents of the technology, providing evidence that increases the magnitude and likelihood of harm to personal health, public health, future generations, and ecological systems as well as the magnitude and likelihood of profits for multi-national companies will produce more negative attitudes. Reducing the perceived desirability and likelihood of better quality food will also produce a negative attitude, as will increasing the perceived likelihood of the use of harmful chemicals and lower economic growth. In addition, emphasising uncertainty would increase the perceived likelihood of occurrence.

To be initially effective, arguments against the purchase of food produced using genetic engineering will need to be directed initially towards women and younger age groups, with an emphasis on similarities between purchasing the food and purchasing food that contains additives or purchasing food that has been produced using herbicides or pesticides. Stressing the importance of adhering to the views of family and friends, where these views are predominantly against purchasing, may also influence intentions towards not purchasing the food. Opponents of the technology may also choose to encourage close scrutiny of the motives of proponents and infer that their information is biased due to the self-interest of proponents. Identifying links between government agencies or universities that support the introduction and development of the food and companies would also make government agencies or universities appear less credible. Government agencies and universities that have involvement with the technology then have an incentive to stress their independence from commercial interests, as evidence of collusion with companies involved in genetic engineering would subsequently undermine their trustworthiness and effectiveness as regulators or impartial observers.

6.5 Summary conclusions and recommendations

This thesis set out to understand the personal motivations that determine whether or not food produced using genetic engineering would be purchased. Attitude, self-identity, subjective norm and PBC have subsequently been found to be important determinants of intentions regarding the purchase of these foods. Intention has been identified elsewhere to be correspondent with behaviour, and previous research has been drawn upon for the
development of an attitude-behaviour model of motivations towards purchasing food produced using genetic engineering. The model was initially tested qualitatively using focus groups. The focus groups were also utilised to develop questions for a postal questionnaire. Statistical analysis of responses to the questionnaire was used to assess the validity of the model and for testing its related hypotheses. This analysis provided support for the model, supported the majority of its related hypotheses and revealed a number of additional relationships that have influence on components of the model. These findings provide insights into personal decision making processes with a person's attitude, subjective norm, sense of self-identity and PBC influencing intentions to purchase, or not purchase, food produced using genetic engineering. The findings also raise a number of theoretical implications and consideration has been given to the practical implications of this study with projections provided of the tactics of proponents and opponents of the technology.

To reconsider the aims and objectives of this thesis, the overall aim, to understand the personal motivations that determine whether or not food produced using genetic engineering will be purchased, has been largely accomplished. One limitation that impacts on the achievement of this aim has been that the survey was not found to be entirely representative of the wider population. Nevertheless, influences on intention and its immediate determinants have been identified for a range of intentions regarding the purchase of the food. In keeping with contemporary approaches, while it is unlikely that these findings apply to all people, it is presumed that they apply to most people, though an accurate prediction of intentions for the population cannot be made from this study. All remaining objectives were achieved. The influences on intentions were identified, projections were made of changes in intentions, and objectives related to the establishment and testing of the model and its related hypotheses, interpretation of results and articulation of implications of the study were achieved.

Theoretical implications arising from this application include (i) establishing a role for attitudes towards a target object in the formation of attitude towards a behaviour, (ii) identifying altruism as a prominent influence on attitude, and (iii) identifying that individuals engage in a process of risk assessment in evaluating the consequences of
their behaviour. In addition, it has been demonstrated that the treatment of intention as a
categorical measure coupled with the use of ordered logit modelling is a suitable method
for structuring and analysing intentions. The study also provided further evidence of the
efficacy of including a measure of self-identity in modelling intentions and identified the
influence of a number of factors on the immediate determinants of intention.

Recommendations for further research extending from the theoretical implications are
that attitude-behaviour models be extended to consider factors which influence
determinants of intention, including attitudes towards targets and, where appropriate,
influences on the perceived risk of performing a behaviour. The application of ordered
logit modelling and the use of a categorical measure of intention is also recommended to
aid in the simultaneous investigation of more than one intention. In addition, as other
studies reviewed in this thesis have indicated, the modification of contemporary
attitude-behaviour models through the addition of additional determinant components
should be a consideration for investigations of intentions to perform behaviours that are
largely subject to the free choice of the individual.

An important finding has been that attitude formed from evaluations of the desirability
and likelihood of salient consequences of purchasing have a substantial influence on
intentions. Any influence which alters these evaluations will therefore directly affect
attitude and subsequently affect intentions. Intentions are also identified as being formed
with reference to a person's sense of self-identity, his or her PBC, representing the
perceived ease or difficulty of identifying the food, and to a lesser extent the subjective
norm which represents the perceived views of family and friends when he or she feels
motivated to comply with these views. Proponents and opponents of the technology may
choose to act upon this information and the anticipated tactics of these groups have been
provided. However, while changes in attitudes and intentions can be considered, how
attitudes and intentions change is an area of research that requires further development.
Nevertheless, this thesis has provided an understanding of the personal decision making
processes utilised in the formation of intentions, which is the first step in mapping the
changes over time in intentions to purchase food produced using genetic engineering.
References:


Appendices

- Letter of invitation to attend a focus group.
- Letter of invitation to complete a questionnaire.
- The postal questionnaire.
Letter of invitation to attend a focus group.

Dear Householder,

My name is Andrew Cook, I am a masters student at Lincoln University. This letter is an invitation for you to participate in a study of public attitudes to purchasing genetically modified food. You may have already eaten some of these foods and have not been aware of them. It is likely that more of them will soon be for sale and you will be able to choose to purchase them or not. I am interested in whether you will choose to purchase them and the reasons for your choice.

Many people admit they don't know a lot about genetically modified food. It is produced using genetic engineering, which involves artificially transferring material from one living thing to another. Living things may be plants or animals, which scientists claim they can improve through genetic engineering.

Some of the questions I wish to discuss are:

- What is genetic engineering?
- What foods are being modified?
- Why are they being developed?
- What are the risks?
- Should they be labelled?
- Should we interfere with natural processes?
- Would you feel comfortable eating genetically modified food?

Your participation will involve attending a local meeting at the *(Place and time of meeting)*. The meeting will be a small discussion group with less than ten other people from your local community. The meeting is expected to take one to two hours and refreshments will be provided.

Your participation in this project is voluntary and subject to you providing your personal consent. To attend the meeting, please complete the enclosed form and return it in the envelope provided. If you have any questions or concerns about participating, please contact Andrew Cook at home, 3836567. You may also contact my supervisor for this project, Dr Geoff Kerr at 3252811.

Your thoughts and ideas would be appreciated and I offer you the opportunity to learn more about the topic.

Thankyou, Andrew Cook
Dear Householder,

This letter is an invitation for you to participate in a study of attitudes to purchasing food produced using genetic engineering. The production of food produced using genetic engineering usually involves transferring genetic material from one living thing to another. In New Zealand experimental crops are being grown and some products on supermarket shelves contain small amounts of genetically engineered material from overseas. I am interested in people's attitudes and intentions to purchase food produced using genetic engineering and will be using this study as the basis for my masters thesis.

In designing this study I have talked to people from Canterbury about their attitudes towards purchasing these foods. Some confidently state their views, but many admit they don't know a lot about the topic. This study is therefore designed to accommodate a broad range of views. Your response would be both welcomed and appreciated and help ensure that a wider range of opinions are included.

To take part in this study please complete and return by freepost the enclosed survey. Please note that participation in this project is voluntary. The results will be published, but your anonymity will be preserved. Also note that by returning the survey you give permission for your responses to be included in this study.

If you have any questions please don't hesitate to call me at my home, ph 03 3836567. You may also call my supervisor for this study, Dr Geoff Kerr, ph 03 3252811.

Thankyou, Andrew Cook.
The postal questionnaire

For all questions please indicate your answer by placing a tick in the box that best represents your response. Space is provided at the end of the booklet for any comments you may wish to make.

Section A

1. How often do you purchase groceries for your household?

☐ Less than once a month  ☐ Once a month  ☐ Twice a month  ☐ Three times a month  ☐ Four times a month  ☐ Five times a month  ☐ More than five times a month

2. How often is your choice of which foods to purchase based on your beliefs about whether or not additives are contained in the food?

☐ Never  ☐ Almost never  ☐ Not often  ☐ Sometimes  ☐ Often  ☐ Almost always  ☐ Always

3. How often is your choice of which foods to purchase based on your beliefs about whether or not herbicides or pesticides were used in their production?

☐ Never  ☐ Almost never  ☐ Not often  ☐ Sometimes  ☐ Often  ☐ Almost always  ☐ Always

4. How much time have you spent talking with other people about food produced using genetic engineering?

☐ Less than 10 minutes  ☐ 10 to 20 minutes  ☐ 21 to 40 minutes  ☐ 41 to 59 minutes  ☐ 1hr  ☐ 1hr 31 minutes  ☐ More than 2hrs

☐ 1hr 31 minutes  ☐ 2hrs
5. How many newspaper items have you read about food produced using genetic engineering?

- [ ] None
- [ ] 1 or 2
- [ ] 3 or 4
- [ ] 5 or 6
- [ ] 6 or 7
- [ ] 7 or 8
- [ ] More than 8

6. How likely or unlikely is it that you would believe statements by a government agency about the benefits and risks of producing food using genetic engineering?

- [ ] Extremely unlikely
- [ ] Very unlikely
- [ ] Unlikely
- [ ] Neither likely nor unlikely
- [ ] Likely
- [ ] Very likely
- [ ] Extremely likely

7. How likely or unlikely is it that you would believe statements by university scientists about the benefits and risks of producing food using genetic engineering?

- [ ] Extremely unlikely
- [ ] Very unlikely
- [ ] Unlikely
- [ ] Neither likely nor unlikely
- [ ] Likely
- [ ] Very likely
- [ ] Extremely likely

8. How likely or unlikely is it that you would believe statements about the benefits and risks of producing food using genetic engineering by a company engaged in its development?

- [ ] Extremely unlikely
- [ ] Very unlikely
- [ ] Unlikely
- [ ] Neither likely nor unlikely
- [ ] Likely
- [ ] Very likely
- [ ] Extremely likely
The postal questionnaire

For the following 2 questions please indicate your level of agreement or disagreement

9. I am the type of person who will purchase food produced using genetic engineering.

- [ ] Very strongly disagree
- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neither agree nor disagree
- [ ] Agree
- [ ] Strongly agree
- [ ] Very strongly agree

10. I am the type of person who will not purchase food produced using genetic engineering.

- [ ] Very strongly disagree
- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neither agree nor disagree
- [ ] Agree
- [ ] Strongly agree
- [ ] Very strongly agree

Section B

Some people believe that the use of genetic engineering in food production will result in the following consequences. Please indicate how likely or unlikely you think it is for these consequences to occur without considering how desirable or undesirable they will be.

1. The development of better quality food from the use of genetic engineering in food production is:

- [ ] Extremely unlikely
- [ ] Very unlikely
- [ ] Unlikely
- [ ] Neither likely nor unlikely
- [ ] Likely
- [ ] Very likely
- [ ] Extremely likely
The postal questionnaire

2. New risks to public health from the use of genetic engineering in food production are:

<table>
<thead>
<tr>
<th>Extremely unlikely</th>
<th>Very unlikely</th>
<th>Unlikely</th>
<th>Neither likely nor unlikely</th>
<th>Likely</th>
<th>Very likely</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

3. Enhanced economic growth from the use of genetic engineering in food production is:

<table>
<thead>
<tr>
<th>Extremely unlikely</th>
<th>Very unlikely</th>
<th>Unlikely</th>
<th>Neither likely nor unlikely</th>
<th>Likely</th>
<th>Very likely</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

4. Increased profits for multinational companies from the use of genetic engineering in food production are:

<table>
<thead>
<tr>
<th>Extremely unlikely</th>
<th>Very unlikely</th>
<th>Unlikely</th>
<th>Neither likely nor unlikely</th>
<th>Likely</th>
<th>Very likely</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

5. Adverse effects on future generations from the use of genetic engineering in food production are:

<table>
<thead>
<tr>
<th>Extremely unlikely</th>
<th>Very unlikely</th>
<th>Unlikely</th>
<th>Neither likely nor unlikely</th>
<th>Likely</th>
<th>Very likely</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

6. Damage to ecological systems from the use of genetic engineering in food production is:

<table>
<thead>
<tr>
<th>Extremely unlikely</th>
<th>Very unlikely</th>
<th>Unlikely</th>
<th>Neither likely nor unlikely</th>
<th>Likely</th>
<th>Very likely</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>
7. A reduction in the use of harmful chemicals in agriculture from the use of genetic engineering in food production is:

- Extremely unlikely
- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely
- Extremely likely

Section C

The following seven consequences are the same as those you have just considered. They are consequences that some people believe will occur from the use of genetic engineering in food production. Please indicate how desirable or undesirable you think it will be for these consequences to occur, without considering how likely or unlikely it would be for them to occur.

1. The development of better quality food is:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable

2. New risks to public health are:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable
The postal questionnaire

3. Enhanced economic growth is:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable

4. Increased profits for multinational companies are:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable

5. Adverse effects on future generations are:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable

6. Damage to ecological systems is:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable

7. A reduction in the use of harmful chemicals in agriculture is:

- Extremely undesirable
- Very undesirable
- Undesirable
- Neither desirable nor undesirable
- Desirable
- Very desirable
- Extremely desirable
Section D

Some people believe that if they purchased food produced using genetic engineering they will be providing support for the use of this technology. They believe that by providing this support they will be contributing to the consequences of the development and use of this technology.

1. How likely or unlikely is it that your purchase of food produced using genetic engineering will support the development and use of this technology?

   [ ] Extremely unlikely
   [ ] Very unlikely
   [ ] Unlikely
   [ ] Neither likely nor unlikely
   [ ] Likely
   [ ] Very likely
   [ ] Extremely likely

Section E

Some people believe that a consequence of purchasing food produced using genetic engineering is that they will be placing their health at risk.

1. If you purchased food produced using genetic engineering, how likely or unlikely do you think it is that you would be placing your own health at risk?

   [ ] Extremely unlikely
   [ ] Very unlikely
   [ ] Unlikely
   [ ] Neither likely nor unlikely
   [ ] Likely
   [ ] Very likely
   [ ] Extremely likely
2. Placing your own health at risk, by purchasing food produced using genetic engineering, is:

- [ ] Extremely undesirable
- [ ] Very undesirable
- [ ] Undesirable
- [ ] Neither desirable nor undesirable
- [ ] Desirable
- [ ] Very desirable
- [ ] Extremely desirable

Section F

1. How easy or difficult is it to purchase or avoid purchasing food produced using genetic engineering?

- [ ] Extremely difficult
- [ ] Very difficult
- [ ] Difficult
- [ ] Neither easy nor difficult
- [ ] Easy
- [ ] Very easy
- [ ] Extremely easy

2. How much control do you think you have over whether you can purchase or avoid purchasing food produced using genetic engineering?

- [ ] No control at all
- [ ] Almost no control
- [ ] Less than moderate control
- [ ] Moderate control
- [ ] More than moderate control
- [ ] Almost complete control
- [ ] Complete control

3. In general what do you think your family or friends views would be of you purchasing food produced using genetic engineering?

- [ ] Extremely unfavourable
- [ ] Very unfavourable
- [ ] Unfavourable
- [ ] Neither favourable nor unfavourable
- [ ] Favourable
- [ ] Very favourable
- [ ] Extremely favourable
4. How influential are the views of your family and friends on your intention to purchase or not purchase food produced using genetic engineering?

☐ Not at all influential
☐ Not very influential
☐ Less than moderately influential
☐ Moderately influential
☐ More than moderately influential
☐ Very influential
☐ Extremely influential

5. Which of the following statements best represents your intention to purchase or not to purchase food produced using genetic engineering?

☐ I have a strong intention to purchase food produced using genetic engineering

☐ I intend to purchase food produced using genetic engineering

☐ I have no intention to purchase or not to purchase food produced using genetic engineering

☐ I intend not to purchase food produced using genetic engineering

☐ I have a strong intention not to purchase food produced using genetic engineering
The postal questionnaire

Section G

The following information is required to check that this survey is representative of the population of Canterbury

1. Sex: □ Male □ Female

2. Age: ______ years

3. Total personal income before tax over the past 12 months:

   □ Less than $5,000
   □ $5,001 to $10,000
   □ $10,001 to $15,000
   □ $15,001 to $20,000
   □ $20,001 to $25,000
   □ $25,001 to $30,000
   □ $30,001 to $40,000
   □ $40,001 to $50,000
   □ $50,001 to $70,000
   □ $70,001 to $100,000
   □ $100,001 or more

4. Tick the box or boxes to indicate which of the following you have completed.

   □ Attended primary school
   □ Attended secondary school
   □ School Certificate in one or more subjects
   □ Sixth Form Certificate in one or more subjects
   □ University Entrance before 1986 in one or more subjects
   □ Higher School Certificate or Higher Leaving Certificate
   □ Diploma, degree or trade certificate qualification resulting from at least three months full time, or part time equivalent, study