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Decision making under sunk cost

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CERTIFICATION

I, Gregory Kenneth Laing, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Accounting and Finance, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Gregory Kenneth Laing
19th October 2002

ABSTRACT

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Gregory Kenneth Laing

This dissertation investigates whether trained professionals can be adversely influenced by sunk cost information when making financial decisions. The rational decision-making model posits that sunk costs are irrelevant to choices between alternative courses of action. However, a review of the literature reveals that, contrary to the assumptions of normative theory, people do not always act in a rational manner when making financial decisions. Moreover, sunk costs are taken into consideration and induce economically irrational behaviour, such as committing more funds to doomed projects which can be described as "throwing good money after bad". Such theoretically irrational behaviour is the subject of behavioural (positive) theories of decision making developed in psychology. Research in cognitive psychology has recognised that people often use heuristics to simplify a decision task.

To test the predicted decision outcomes of expected utility theory a model was developed based on prospect theory and image theory. In the context of prospect theory, sunk cost and framing of the decision task were manipulated. Image theory was tested by inclusion of problem space items and image compatibility questions. The model provided a suitable conceptual framework for empirically testing the "sunk cost effect". Testing for the existence of the sunk cost effect was focused on the decision behaviour of particular professional groups and evidence was gathered using survey instruments adapted from previous research. The professions surveyed were managers, accountants and financial planners. A hypothetical outsourcing task was the basis of the survey of managers and accountants. A hypothetical investment task was used to survey the financial planners and was also included in the survey of the accountants.

The results of the investment task are consistent with image theory, the level of responsibility was found to be positively correlated with a higher level of funding. In the investment task the perceived level of responsibility for making the initial decision was found to be a contributing factor to escalation of commitment. An unexpected result was that both the low and high image compatibility were found to be significant predictors of the level of additional funding in the investment task. However, the statistical significance of the high image compatibility was smaller compared to that of low image compatibility. The sunk cost effect was found to be significant in both the outsourcing task and in the negative framed version of the investment task. The sunk cost effect was not statistically significant in the positive framed version of the investment task. An unexpected result was that framing produced risk behaviour that was contradictory to the prediction of prospect theory. Negative framing, which should have produced risk-taking behaviour resulted in risk-avoidance behaviour and positive framing which should have produced risk-avoidance behaviour resulted in risk-taking behaviour. The sunk cost effect was found to be nearly ubiquitous in the three professional groups. This effect was observed across a range of tasks. The strength of the effect depended on the relative magnitude of the sunk cost and other contextual factors allowed for in the survey instruments, but remained constant regardless of these influences to an observable degree.

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BRIEF TABLE OF CONTENTS

VOLUME 1

VOLUME 2

TABLE OF CONTENTS

VOLUME 1

VOLUME 2

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
Introduction to the Research

Chapter Introduction

A major source of non-rational behaviour, of concern to management accountants, is the treatment of sunk costs in decision making. This dissertation argues that a specific form of non-rational behaviour – sunk cost effect – cannot be explained within the normative theory of rational decision making. Cognitive theories from the behavioural sciences are used to investigate such behaviour observed to occur with financial professionals in Australia.

This chapter commences by examining the theory of rational decision behaviour and the failure of the normative model to address non-rational behaviour. To account for observed violations of the normative model, two cognitive theories— prospect theory and image theory— are introduced and discussed. The non-rational behaviour, referred to as the "sunk cost effect", occurs when sunk cost information is regarded as relevant when it should be disregarded. The sunk cost effect is outlined thus leading to the statement of the objective of the study. Definitions of terminology of particular importance in the dissertation are provided and the boundaries of the research problem are discussed. The specifics of the research design and methods employed in the dissertation are reviewed. Finally, the assumptions and limitations are discussed and the organisation of the dissertation is presented.

Background to the Research

Research has revealed that sunk cost is a cause of error in decision making that can result in excessive costs to business and society. For example, the decision to continue with the Shoreham Nuclear Power Plant project that commenced with an original cost estimate of $75 million (US) was mistakenly escalated. The project took 23 years to complete, only to be closed before becoming fully operational due to safety issues and technological obsolescence. By the time of closure the cost had blown out to $5 billion (US) (Ross and Staw, 1993). Other examples of the sunk cost effect have been documented as occurring in decisions regarding information technology projects (Keil,

1995; Drummond, 1998) and real estate development projects (Cornell, Longstaff & Schwartz, 1996). However, the sunk cost effect is not just a major problem in business decision making the effect *can* and *does* arise in real life influencing every-day decisions (Drummond, 1994). Seemingly simple decisions such as waiting for an inordinately long time for a bus to take you someplace where you could just as easily have walked (Brockner, 1992) or situations where you are waiting in a queue at a supermarket.

The inclusion of sunk cost information in decision making is a major source of non-rational behaviour of concern to management accountants. The normative assumptions of management accounting consider information regarding sunk cost as immaterial to the decision-making process. This type of non-rational behaviour— referred to as the "sunk cost effect"— arises when sunk cost information is regarded when it should be disregarded as irrelevant. Implicit in the normative view of rational decision making is the concept that once an asset is irrevocably committed and cannot be changed, or a contract is irrevocably committed and cannot be changed, then the cost of that asset or contract is sunk (Mas-Colell, Whinston & Green, 1995, 131).

This dissertation is concerned with the effect that sunk cost information has on the behaviour of those engaged in financial decision making. Once a cost is sunk, it becomes irrelevant to any decisions pertaining to the present or future (Horngren, Foster & Datar, 2000, 379). Therefore, financial decision makers are prohibited from regarding or taking into consideration any sunk cost information in the decision-making process. The aim of the research was to investigate the conditions under which sunk cost information is likely to be included in the decision-making process.

The Theory of Rational Behaviour

The normative theory of rational decision making posits that individuals seek to optimise or maximize utility and that rational behaviour can be characterised as a decision process that can be modelled (Schwartz, 1998, 39). The rational decision-making model sets down a sequence of steps to be followed in evaluating alternative courses of action (Parayre, 1995). The assumptions implicit in rational behaviour follow from value judgments allowing for human preferences (Whynes, 1983, 198):

> *The entire framework of economics...of whatever paradigm or in whatever application...rests on a fundamental premise, namely that people behave rationally. By "rationally", I mean simply that before selecting a course of action individuals will consider the expected benefits and costs of each alternative and they will then select that course of action which generates the highest expected net benefit.*

The basic unit of all human preference is expressed in terms of "expected utility" which expresses the ultimate goal of the individual's behaviour as governed by profit maximization (Zey, 1992, 18). However, a number of violations of the goal of profit maximisation are documented in the literature (Allais, 1953; Myers, Suyddam & Gambino, 1965; Kahneman & Tversky, 1979; Wiseman & Levin, 1996). The rational decision model is also criticised for being insensitive to the cognitive limitations possessed by individuals (Simon, 1979). The inclusion of sunk cost information leads to decision outcomes that do not maximize profit. Therefore, this decision-making behaviour is not rational in the sense that the decision outcome is contrary to normative assumptions of utility maximization (Ellsberg, 1961).

Failure to Address Non-Rational Outcomes

An early attempt by Edwards (1954) to incorporate the behavioural aspects of decision making was modelled as if decisions always followed normative, rational, decision rules. This approach to the behaviour of decision-making processes virtually ignore the psychological side of the individual decision maker. If the phenomenon being observed is related to the psychological or cognitive processes of the individual, why then are the theoretical models most commonly based on economic or mathematical formulas? The most explicit answer is provided by Northcraft and Wolf (1984). They argue that in cases where it is economically advisable to allocate additional resources (in spite of negative feedback), any psychological causal mechanism is superfluous because a simple economic explanation is equally predictive and more parsimonious. Bowen (1987, 56) concluded that this explanation was satisfactory justification for continued research based on economic models.

The evaluation process upon which judgements are made reflects the preferences of the individual involved. Intuition, flair and judgement are part of the conceptual skills

exercised by professionals when they make choices based on their substantive knowledge concerning the subject matter of their expertise (Bonner, 1994). Individuals give meaning to information and the ability to make decisions is therefore a function of both the individual and the task (Awasthi & Pratt, 1990; Shapira, 1995). Research suggests that this intuitive choice process is no longer adequate (Kahneman & Tversky, 1979; Loomes & Sugden, 1982; Staw & Ross, 1987; Pablo, 1997). Researchers have repeatedly demonstrated empirically that human judgement and decision-making behaviour does not always follow the assumptions of the normative theories (Allais, 1953; Kahneman & Tversky, 1979) and continue to empirically demonstrate non-rational decision making of including cost information that should have been ignored (Thaler, 1980; Staw, 1981; Arkes & Blumer, 1985).

Prospect Theory and Decision Behaviour

Unlike economic theory, which is based on normative preference axioms, prospect theory takes an inductive/deductive approach to examining risky choice; that is choice where there is a great degree of uncertainty (Laibson & Zeckhauser, 1998). Kahneman and Tversky (1979) introduced prospect theory in response to the shortcomings of research into decision making based on expected utility theory. Further research demonstrated that decisions are affected by how outcomes are framed (whether the wording is positive or negative) (Kahneman & Tversky, 1979; Fagley & Miller, 1987; Miller & Fagley, 1991; Tversky & Kahneman, 1981, 1992). The study of framing effects in the context of decision making was confirmation of the adage, "*...it's not just what you say, but how you say it*" (Blount & Larrick, 2000).

Prospect theory assumes that choices are evaluated in a two-step process: an initial phase of editing and a subsequent phase of evaluation. In the editing phase, the choice outcomes are coded as gains or losses relative to some reference point— which is usually the current asset position, but may be influenced by the presentation of a choice or by expectations of the decision maker (Kahneman & Tversky, 1979). Tversky and Kahneman (1981) and Kahneman and Tversky (1984) also introduced the concept of mental accounting as a type of decision framing in which individuals form psychological accounts of the advantages and disadvantages of an event or choice. Data considered irrelevant to the decision is relegated to a separate mental account. The

concept of mental accounting was used to describe the propensity to sell winners too early and retain losers too long when dealing with investments in securities (Shefrin & Statman, 1985) and as a starting point for a model of consumer behaviour (Thaler, 1980; 1985).

Based on the evidence this dissertation argues that non-rational behaviour that violates the axioms of rational decision making can be observed in accounting and financial professionals making financial decisions when sunk cost information is provided, despite their training in the normative decision model.

Statement of the Research Problem

Prior research in financial decision making focuses primarily on the decision-making processes that conform or break with expected utility theory and are presumed to determine an optimal allocation of resources. The primary focus of past research was to test the impact of variables such as framing, reference point selection, weighting of alternatives, and mental accounting approaches with little or no attention to the potential of cognitive or personality variables which might moderate the decision-making process. Further, while reference was made to accounting (as in the topic of mental accounting), little attention was paid to the variety of accounting choices or models that could be employed in analysing financial information and determining the decision outcome.

The "Problem" of Sunk Cost

The term "sunk cost" has a long history dating back to early analysis of costing in the economics literature (Taussig, 1891; Brown, 1916; Clark, 1923). The definition of sunk cost varies slightly across the economic, finance and accounting disciplines. However, the basic tenet of sunk cost information's irrelevance to the decision process remains constant. The following definitions provide evidence of this consistency:

> ***Microeconomics-*** *A sunk cost is an expenditure that has already been made and cannot be recovered* (Pindyck & Rubinfeld, 2001, 205).

> ***Finance***- *A sunk cost refers to an outlay that has already occurred (or been committed), so it is an outlay that is not affected by the accept/reject decision under consideration* (Brigham & Gapenski, 1993, 263).
>
> ***Management Accounting***- *Past costs that are unavoidable and irrelevant because they cannot be changed no matter what action is taken* [are sunk costs] (Horngren, Foster & Datar, 2000, 379).

The common theme is that past costs cannot be avoided and are irrelevant to decision making *because* they cannot be changed. In other words, sunk costs are irrelevant because they do not contain information about the future effects of the decision. Another view is that sunk costs are irrevocably committed and thus irreversible (at least in the short-term) and are not relevant to the *economic* consideration of alternative courses of action (Terry & Ford, 1984; McEachern, 1997; Frank & Glass, 2000).

Financial decision making primarily evolved from microeconomic models that treat sunk cost information as irrelevant to decision making. Stermole (1982, 294) provided the most comprehensive explanation for excluding sunk costs from economic and financial considerations:

> *In general sunk costs are past costs that nothing we do now or in the future can affect. Costs that are relative to evaluations in general are future costs that have not been made. Evaluations should be made to determine if proposed costs should be incurred or not, and if they are incurred, to determine what economic gains will be realised that would not be realised if we do nothing.*

Sunk Cost and Rational Behaviour

The argument for the exclusion of sunk cost information is part of the normative view of rational behaviour that prescribes a "rational" approach to economic and financial decision making. To illustrate a decision involving sunk cost information, a special order task is presented as Example 1.1 (Horngren, Foster & Datar, 1994, 415). The technique used to determine the optimal outcome is in accordance with economic theory and depends on the decision maker identifying the relevant information (future costs that vary between alternatives) and disregarding irrelevant information (sunk costs).

Example 1.1 Special Order

Woody Company, which manufactures slippers, has enough idle capacity available to accept a one-time-only special order of 20,000 pairs of slippers at $6 a pair. The normal selling price is $10 a pair. Variable manufacturing costs are $4.50 a pair and fixed manufacturing costs are $1.50 a pair. Woody will not incur any marketing costs as a result of the special order. What is the effect on operating income if the special order could be accepted without affecting normal sales?

Solution:

	All costs Per pair	**Relevant costs Per pair**	**Total**
Sales	$6.00	$6.00	$120,000
Variable Costs	$4.50	$4.50	90,000
Contribution margin	$1.50	$1.50	30,000
Fixed costs	$1.50	-	
Operating Income	-	$1.50	$ 30,000

Comments:

The relevant costs are the expected future costs that differ between the alternatives— in this case— the variable manufacturing costs of $4.50 per pair. The fixed manufacturing costs (including the marketing costs) are irrelevant, as they will not change whether or not the special order is accepted. Accepting the order will not increase fixed costs, for example, the costs of set-up and production scheduling, because there is surplus capacity of those resources. Therefore the only relevant items for consideration are sales revenue and variable manufacturing costs.

Acceptance of the special order will contribute $1.50 per pair or a total of $30,000 to the operating income of the company.

This example emphasises the appropriate treatment of sunk cost information in determining the relevant information upon which to base a decision. This example from a management accounting text is consistent with the normative economic and financial theories that sunk costs should be treated as irrelevant to the decision at hand.

Justification of the Research

Boundaries of the Research Problem

A central assumption of training for financial decision makers is that all decision outcomes must maximize utility to the individual. The argument for this belief is derived from neo-classical microeconomic theory of the rational decision maker. In this framework, all people are held to be rational; the optimal financial decision is to either maximize profit or minimize cost. This normative framework is woven into the approaches to financial decision making in management accounting as well as finance. However, the extant behavioural psychology literature identified a phenomenon of decision making, which violates the normative assumptions, namely the sunk cost effect. Parayre (1991, 23) defined the sunk cost effect as *"the tendency to persist with a committed course of action beyond what economic rationality, based on marginal costs and benefits, would dictate."* This sunk cost effect manifests in cases involving sequential decisions and results in a tendency to escalate commitment to a course of action that will not maximize profits or minimize costs.

Prior research established that considerable variation exists in the degree to which decision makers actively review, analyse and then use the information to which they have been exposed (Langer, 1989b; Isen, 1984; Wofford & Goodwin, 1990; Wright & Bower, 1992). Dunegan, Duchon and Ashmos (1995) argued that establishing a better understanding of variability in information use contributes to more accurate decision modelling and improved theory development. This dissertation contributes to the body of knowledge in the field of behavioural management accounting literature by advancing the knowledge of the specific variables influencing the financial decision maker to include sunk cost information and provides a pathway for further behavioural research in the field of management accounting. In addition, the study represents an area of research in decision making that has received little attention in the field of management accounting.

Three surveys provided the empirical evidence to investigate the sunk cost effect. The first survey was conducted on managers from public and private hospitals within Australia. The health care sector plays an important role in the Australian economy. For

the financial period 2000-2001, the Commonwealth Government funding provided under the Australian Health Care Agreements was $6.3b (ABS, 2002). Initiatives by the State and Federal Governments to corporatise the public sector impact on the administration and managerial decision processes of public hospitals throughout Australia (Harris, 1999; Chua, 1995) with an emphasis on cost reduction.

Research findings indicate that outsourcing as a type of cost reduction is growing rapidly in the health care sector with research primarily based on the United States of America (Hensley, 1997; Chin, 1997);. Given the economic importance of the sector in the Australian economy, the inclusion of hospitals in this research was considered to contribute to the understanding of financial decision making within the sphere of the managerial change that has occurred. The research also provided a basis to compare financial decision making in public and private hospitals.

The second survey was conducted using financial planners in Queensland, Australia. Financial planners were selected on the basis that they provide expert analysis of financial information upon which investment decisions are based and are expected to be less subject to cognitive biases due to their training. In addition, the investment advising/financial-planning sector plays an important role in the Australian economy. Research into the decision-making processes of financial planners has been minimal. Researching the decision making of financial planners was considered to provide a basis to compare their decision outcomes with the decision outcomes of accounting professionals.

The third survey was conducted using accounting professionals in Queensland, Australia. Accountants were selected as subjects for the study because they perform management roles in various businesses and also provide expert analysis of financial information. Most research into decision making by professional accountants is concerned with auditing procedures and financial statement preparation. This research places a greater emphasis on management accounting topics and the impact of prior knowledge through training in the application of the relevant cost model in decision making.

Objectives of the Study

Prior literature confirmed the existence of the "sunk cost effect" or "sunk cost phenomenon" where sunk cost information was demonstrated to influence the outcome of the decision process. The extant research examined this phenomenon in various settings, most commonly in laboratory and experimental settings. A noticeable limitation was the lack of testing on professional target populations who have "real world" experience in the tasks. To broaden the research focus, this dissertation examined the effect of the sunk cost phenomenon on three professional target populations: hospital managers, accountants and financial planners using the survey method. At the centre of this investigation was the measurement of the degree to which professional financial decision makers empirically exhibited similar levels of susceptibility to the sunk cost effect. This is of importance because trained professionals are expected to be less susceptible to the sunk cost phenomenon due to their explicit education and experience.

All three surveys answered one central research question:

> *Are trained professionals adversely influenced by sunk cost when making financial decisions?*

Definitions

The following is a list of definitions, which relate to terms used in this thesis. The list is presented in alphabetical order.

Cost - Cost is a central theme in economic reasoning; much accounting theory was developed to "account" for costs (Pieters, 1989, 442). Buchanan (1969, 7) argued that the basic meaning of the word "cost" was pain or sacrifice. Asking a person *"how much did that cost?"* is analogous to asking *"how much did you have to sacrifice or how much pain did you have to bear to gain that item?"* (Pieters, 1989, 442).

Expected Utility Theory – Expected utility theory is a normative model of risky decision behavior based on the idea that people maximize expected utility in selecting among gambles (Wright, 1985, 4).

Framing – The presentation of information in different, but objectively equivalent, descriptions of the same problem (Levin, Schneider & Gaeth, 1998, 150).

Gambles – Economic decisions made under uncertainty are defined as gambles (Frank, 1998, 191).

Mental accounting – A type of decision framing in which individuals are hypothesised to form psychological accounts of the advantages and disadvantages of an event or choice (Henderson & Peterson, 1992).

Opportunity cost –The contribution to income that is foregone (rejected) by not using a limited resource in its next-best alternative use (Horngren, Foster & Datar, 2000, 388).

Probability – The long-term relative frequency of particular outcomes— for example, the outcome of a toss of a coin (Freedman et al., 1991, 208). A probability is a number between zero and one that measures the chance of some possible event occurring (McTaggart, Findlay & Parkin, 1996, 402).

Prospect – A prospect is a course of action that yields a particular outcome (Kahneman & Tversky, 1979, 263). Alternative courses of action are referred to as choices or prospects within the economic literature (Elliott & Archibald, 1989, 321). Decision making under risk implies a choice between prospects or gambles.

Prospect Theory – Prospect theory is a descriptive model that modifies expected utility theory in order to accommodate human decision behaviour that violates expected utility theory (Tversky & Kahneman, 1981).

Rational Behaviour –Rational behaviour may be characterised as making choices consistent with maximizing the expectation of some utility index (Hagen, 1985) where the utility function obeys certain axioms of preference (Arrington and Puxty, 1991).

Reference Point – In prospect theory, the reference point is deemed to represent the status quo or how things are presently (Kuhberger, Schulte-Meclenbeck & Perner, 1999, 206). The reference point is used to determine whether a given outcome is evaluated as a gain or loss (Tversky & Kahneman, 1981, 456).

Risk – Risk is uncertainty with probabilities attached to each possible outcome (McTaggart, Findlay & Parkin, 1996, 402). However, definitions of risk may range from an emphasis on threat of personal harm in the medical and hazard disciplines to an emphasis on possible opportunities with varying levels of potential success as found in the economic and business disciplines (Yates & Stone, 1992). A situation involving risk may be described as being analogous with the flipping of a fair coin (Shapira, 1995, 4).

Risky choice – A risky choice may be characterised as a situation in which the decision maker is not sure which outcome will occur (Shapira, 1995, 4) and implies that *"one can either gain or lose by selecting a particular alternative"* (Shapira, 1995, 43). Choice situations with genuinely incomplete information may be characterised as "risky choices" (Elster, 1986, 5).

Subjective Expected Utility Theory – Subjective expected utility theory is a normative model of risky decision behavior where a subjective probability function is used in conjunction with a utility function to represent risky preferences (Payne, 1985, 3).

Sunk cost- Past costs that are unavoidable and irrelevant because they cannot be changed no matter what action is taken (Horngren, Foster & Datar, 2000, 379).

Uncertainty – Uncertainty is a state in which more than one event may occur, but no one can predict which event will occur. To describe uncertainty, the concepts of probability and risk are commonly used (McTaggart, Findlay & Parkin, 1996, 402).

Research Design and Methods

The next three sub-sections discuss aspects of the research design and methods employed in this dissertation.

Behavioural Model and Theories

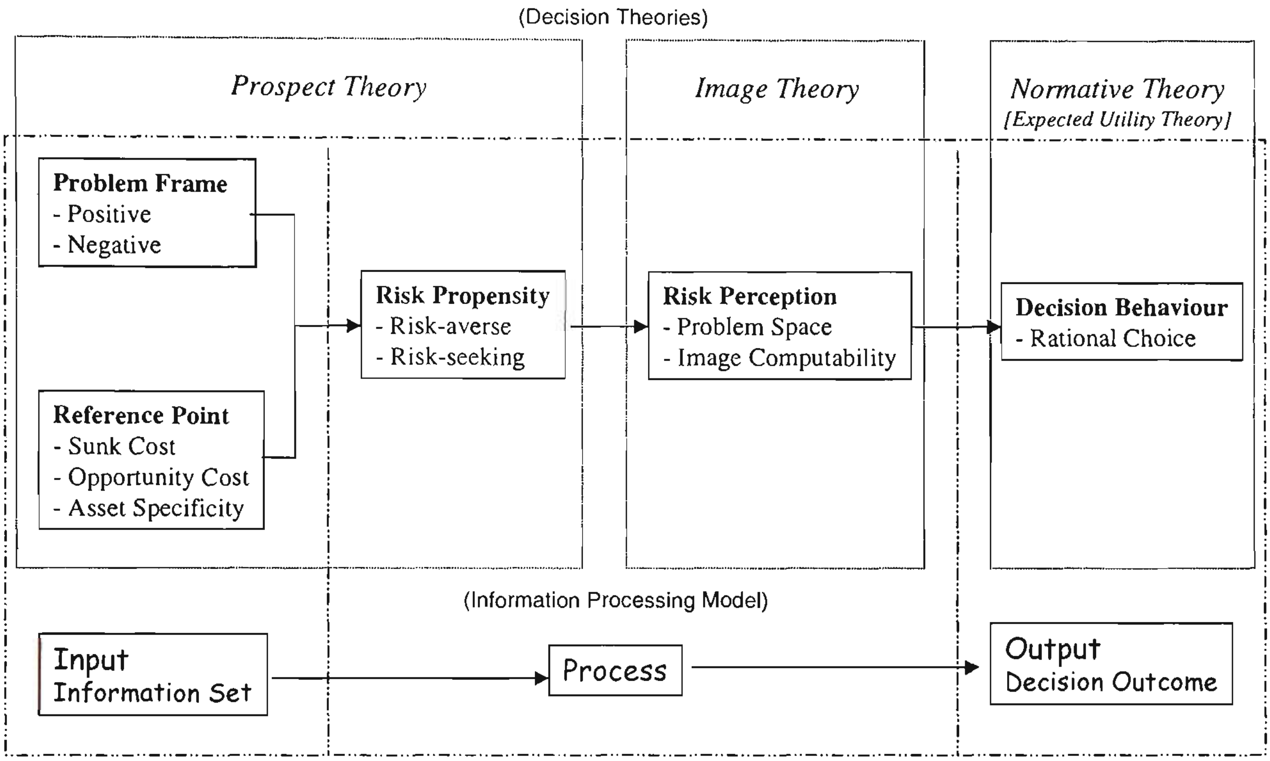
The rational decision making model assumes that individuals thoroughly process all relevant information in order to choose the optimal course of action (Lord & Maher, 1990). However, previous research showed that certain characteristics of information, such as sunk cost and framing, might lead an individual to make sub-optimal decisions. This research study employed three separate surveys to examine aspects of the same phenomenon using subjects derived from different professional groups. The choice of a multiple-survey approach was based on the literature— which suggested that the nature

of decision making involving sunk cost information might be better examined from a triangulation of findings— and that the focus of research should be on tasks common to the subject groups.

The thesis was structured so that an information-processing model derived from Libby and Lewis (1977; 1982) provided the basis for testing constructs from combined theoretical models reported in Chapter 5, Chapter 6 and Chapter 7. The model assumes that when an individual is confronted with a choice— the input is the relevant information set or data which is combined or processed by the individual to determine a choice from among the alternative courses of action (Libby & Lewis, 1977). The model focuses on the ability of decision makers to use the information presented. In this regard, the model was consistent with the objective of this dissertation. This objective was to test the ability of decision makers to distinguish between relevant and irrelevant information (the sunk cost effect) as well as measure the influence of the manipulation of information (the framing effect) on the decision outcomes.

The basic model is represented in Figure 1.1. The model applied to the survey results was a means for testing the use of information— manipulated through the inclusion of sunk cost information and framing— with the interplay of various intervening and moderating variables on the decision outcome. Peters (1993, 385) suggested that a strategy of combining models and theories would strengthen the understanding of accounting decision making. This research was designed to test the combination of decision theories (prospect theory and image theory) within a simple information processing model as suggested by Peters (1993).

Figure 1.1
Theoretical Research Model



This information processing model when overlaid with prospect theory, image theory and expected utility theory provided an integrated perspective of the role of the key constructs from each of the theories. Figure 1.1 demonstrates the relationship between the input or *information set* (which in prospect theory is the problem frame and reference point) and the *process* (which in prospect theory is the risk propensity and in image theory is the risk perception) and the output or *decision outcome* (in expected utility theory this is the optimal choice).

Multiple Survey Design

In the first survey, the instrument consisted of an outsourcing decision set within the context of the hospital sector. The information concerning the task was manipulated to produce six different versions of the instrument. The manipulations were of details regarding sunk cost, opportunity cost and asset specificity. The details of the different versions are presented in Table 1.1. The task was based on the research of Roodhooft and Warlop (1999), modified to suit the Australian environment and accommodate improvements suggested in the literature.

Table 1.1
Summary of Survey Details Outsourcing
(Public hospitals N= 128; Private hospitals N= 89)

Version	*Make option*	*Outsource (buy) option*
A	Production cost: $3,000,000	Purchase price: $2,600,000 Investment (not asset specific): $300,000
B	Production cost: $3,000,000	Purchase price: $2,600,000 Asset specific investment: $300,000
C	Production cost: $3,000,000 Sunk investment: $1,400,000	Purchase price: $2,600,000 Investment (not asset specific): $300,000
D	Production cost: $3,000,000 Sunk investment: $1,400,000	Purchase price: $2,600,000 Asset specific investment: $300,000
E	Production cost: $3,000,000 Sunk investment: $500,000	Purchase price: $2,000,000 Investment (not asset specific): $300,000
F	Production cost: $3,000,000 Sunk investment: $500,000	Purchase price: $2,000,000 Asset specific investment: $300,000

The second survey used an instrument that consisted of an investment decision set in a context consistent with an investment appraisal. The information concerning the task was manipulated to produce three different versions of the survey instrument. The different versions in this survey were directed to testing the sunk cost effect, the framing effect, the perceptions of problem space and image compatibility.

The first two versions had the same amount of sunk cost. However, one version consisted of a positive frame and the other a negative frame. These two versions were designed to test the framing effect. The remaining version had the same negative frame; however, the amount of the sunk cost was less. This version was designed to test the sunk cost effect. In addition to the framing and sunk cost manipulations there were standard questions which addressed cognitive perceptions of problem space and image compatibility in all three versions. The three versions are summarised in Table 1.2. The task was based on research reported by Dunegan (1993) and Dunegan, Duchon and Ashmos (1995) with modifications as suggested by the literature and to be consistent with the Australian setting.

Table 1.2
Summary of Survey Details Pertaining to Investment
(Financial Planners N=86)

Version	*Wording*	*Framing*
1 (n=31)	High Sunk Cost ($400,000)	Negative
2 (n=33)	High Sunk Cost ($400,000)	Positive
3 (n=22)	Low Sunk Cost ($100,000)	Negative

The third survey instrument consisted of two tasks— an outsourcing task and an investment decision task, each of which was set in a context consistent with the accounting profession and the Australian setting. The information concerning the outsourcing task was manipulated to produce four different versions of the survey instrument, which are summarised in Table 1.3.

Table 1.3
Summary of Task 1 Details pertaining to Outsourcing (Accountants N= 237)

Version	*Make option*	*Outsource (buy) option*
A	Production cost: $ 133,000 Sunk investment: $ 30,000	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a. $10,000 Revenue from sale of asset (one off framed as $10,000 revenue on disposal)
B	Production cost: $ 133,000 Sunk investment: $ 30,000	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a. $10,000 Revenue from sale of asset (one off framed as $20,000 loss on disposal)
C	Production cost: $ 133,000 Sunk investment: Nil	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a.
D	Production cost: $ 133,000 Sunk investment: Nil	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a. Asset Specificity: $ 500 pay slip machine.

The first task was based on an outsourcing decision (Roodhooft & Warlop, 1999) with framing effects (Kahneman & Tversky, 1979) and self-evaluation questions (Northcraft & Neale, 1986; Duchon, Dunegan & Barton, 1989). Additional information introduced asset specificity and an opportunity cost. The second task consisted of an investment decision set in a context consistent with an investment appraisal. The information concerning the task was manipulated to produce three different versions of the survey instrument. The differences in this survey were directed to testing the sunk cost effect, the framing effect, and perceptions of problem space as well as image compatibility.

To test the relevance of the sunk cost and the framing effect, all reference to the sunk cost was deleted in the third and fourth versions of this task. In the fourth version, an investment was required for equipment to process the pay slips. The amount of $500

was not enough to change the overall financial benefit in favour of outsourcing. This asset, however, could not be used by the firm nor by any other payroll provider and had no resale value. Thus, the investment was asset specific to the outsourcing option. Four versions of task one were presented to subjects. The versions were distinguished according to (1) the existence of a positive frame, (2) the existence of a negative frame, (3) the absence of a sunk cost and no frame, and (4) the absence of a sunk cost, no frame and additional asset. The second task was based on research by Dunegan (1993). The differences between versions are summarised in Table 1.4.

Table 1.4
Summary of Task 2 Details Pertaining to Investment
(Accountants N=237)

Version	*Wording*	*Framing*
X1 (n=51)	Minimal	Positive
X2 (n=32)	Expanded	Positive
Y1 (n=41)	Minimal	Negative
Y2 (n=45)	Expanded	Negative
Z1 (n=35)	Expanded & Reduced sunk cost	Positive
Z2 (n=33)	Expanded & Reduced sunk cost	Negative

Variables

Due to the nature of the multiple survey approach, more specific details of the variables are discussed in the relevant chapters. However, a general summary of the characteristics of the types of variables follows.

Independent variables

An independent variable is the phenomenon or characteristic hypothesised to affect the dependent variable (Sproull, 1995, 30). The main independent variable in each of the surveys is sunk cost information. Sunk cost information was manipulated in three different ways: high sunk cost, low sunk cost and no sunk cost. The other independent variable is the framing of the task. Framing was also manipulated in three different ways: a positive frame, a negative frame, and a neutral frame.

Moderator variables

Moderator variables are a type of independent variable which are hypothesised to modify the relationship between the independent and dependent variables (Sproull, 1995, 31). Moderating variables identified in this research are the age of the subject and perceived image compatibility.

Control variables

Control variables are variables that may affect the relationship between the independent and dependent variables (Sproull, 1995, 32). The effect of the control variable may be cancelled out by eliminating the variable, holding it constant or using statistical methods. An example of a control variable used in this research is gender.

Dependent variables

The dependent variable is the phenomenon or characteristic hypothesised to be the outcome of some other variable, which is usually the independent variable (Sproull, 1995, 29). The dependent variable in this research is the decision outcome.

It should be noted that some of the variables measured in this research had different operational definitions in the three different survey studies.

Statistical Methods Employed

The following is an outline of the statistical methods used to analyse data and the statistical software employed to perform the analysis in this dissertation.

Chi-square

The chi-square test is a statistical test for categorical (nominal) data. It is used to test independence as well as goodness-of-fit (Vogt, 1999, 39). The chi-square test was used to test for significant differences between the observed distribution of data among categories and the expected distribution based upon the null hypothesis (Emory & Cooper, 1991, 536).

Multiple Regression Analysis

Multiple regression analysis is considered to be the appropriate method of analysis when the research problem involves two or more metric (ordinal or interval data) independent variables which are presumed to be related to a single metric (ordinal or

interval data) dependent variable (Hair et al., 1998, 14). The objective of the analysis is to predict the amount or magnitude of the change found in the dependent variable in response to variation of the independent variables

ANOVA

Analysis of variance (ANOVA) is the statistical method (parametric test) for testing the null hypothesis that the means of several populations are equal (Emory & Cooper, 1991, 536). One way analysis of variance uses a single factor, fixed effects model to compare the effects of one factor on a continuous dependent variable.

Principal Component Factor Analysis

Factor analysis, including principal component analysis, is a statistical approach used to analyse interrelationships among a large number of variables and was used to explain these variables in terms of their common underlying dimensions or factors (Hair et al., 1998, 14).

SPSS Computer Software

SPSS (originally Statistical Package for the Social Sciences) is a comprehensive system widely used for analysing data (Brace, Kemp & Snelgar, 2000, 12). Version 10.0 for Windows was used to conduct the statistical analysis in this dissertation.

Assumptions and Limitations of the Research

There are a number of assumptions implicit in this dissertation. First, the predictive capabilities of normative theory to explain real world decision behaviour were considered to be limited. Second, prior research that found violations of the model of rational decision behaviour were assumed to be valid arguments that normative theory is limited in its application. Third, there was an assumption that the training of decision makers might be at fault through the continuing support of normative unreality. Fourth, an assumption was made that, due to the nature of the professions and the consistency of regulations across Australia, samples restricted to one state should be representative of the wider population.

There are also a number of limitations that constrained the research reported in this thesis. First, the context in which the research was conducted was constrained by differences between economic conditions in Australia compared to other countries as well as differences in accounting regulations, management and administration differences. Second, generalisability is limited because of the samples which were chosen from one State (Queensland). Third, cost constraints and time constraints limited the capacity to broaden the sample size and to incorporate other methods of data gathering, such as interviews. Fourth, the surveys collected data that reflect a decision made at one point in time rather than a longitudinal or time series approach. This may bias the perception of the importance of the task to the decision maker. However, to address this matter, subjects were asked to indicate the level of perceived importance of the task. The precise details are reported in the relevant chapters.

Organisation of the Study

This thesis is presented in eight chapters. Chapter 2 presents the normative theory of rational decision making and provides the basis for determining the rules that constitute rational decision behaviour.

Chapter 3 provides the behavioural theories underpinning approaches to examining decision behaviour that deviates from the normative model. Chapter 3 also introduces the variables and approaches devised in prior studies.

Chapter 4 is a discussion of the research methods employed. Issues of validity and applicability of the direct mail survey approach are considered and the process as used in the design and application are discussed. Three surveys were conducted on three different sets of subjects derived from different populations, specifically hospital managers, accountants and financial planners.

The analysis, interpretations and discussions in accordance with the hypotheses tested for each of the three surveys are presented in Chapters 5, 6 and 7. A summary of the findings and conclusions are presented in Chapter 8.

CHAPTER 2
Normative Theories of Sunk Cost

Chapter Introduction

Normative theories concerning decision making overlap throughout economic theory, finance, and management accounting literature. Due to the overlapping nature of the normative theories and their underlying assumptions, the treatment of sunk cost is examined from the perspective of specific models of decision making proposed by economic theory, finance, and management accounting. This chapter investigates the similarities and differences in the normative approaches to the treatment of sunk cost information within decision making across the business disciplines.

Chapter 2 is organised into six parts. The first part provides a background to the normative theory of decision making and the rational decision-making model. The second part addresses decision-making issues in economic theory including decision making specific to expected utility theory with examples of decision making under sunk costs in economics. The third part considers issues related to decision making in finance by discussing investment appraisal methods and the treatment of sunk cost information in finance with an example of a capital budgeting problem. In the fourth part, issues in decision making in management accounting are dealt with by examining rational choice in management accounting and the relevant decision techniques with examples of the treatment of opportunity and sunk costs. In the fifth part, the analysis focuses on providing evidence that all the normative decision models either explicitly or implicitly treat sunk cost as irrelevant. Finally, the sixth part provides a chapter summary.

Background to Normative Theories of Sunk Cost

Normative Theory of Decision Making

Normative theory provides prescriptions, or detailed outlines, for *how* things ought to be done. In economics, normative theory provides assumed objectives in terms of prescriptions for rational behaviour (Lee, 1987, 167). In terms of decision making, normative theory prescribes an evaluative process of rational behaviour without regard to the choices that individuals might actually make (Lee, 1971, 16). In contrast, descriptive theories (as outlined in Chapter 3) are concerned with the choices "real"

people actually make regardless of the choices they *should* make. To acquire better insight into rational decision making, it is necessary to explore the origin and nature of these normative prescriptions for rational behaviour. This research investigated the tensions between the prescriptions for rational decision making and the actual observed behaviour of individuals in decision-making situations in a management accounting context.

Rational Decision-Making Model

The rational decision-making model is normative in that it takes a prescriptive, rather than a descriptive, approach to decision making. The model prescribes the conditions under which individuals make rational decisions (Harrison, 1993, 27). The rational decision model essentially describes the behaviour of an idealised individual. The individual's behaviour is idealised in the sense that individuals are assumed to be capable of expressing both consistent preferences and consistent beliefs (Hogarth, 1980, 65). In the rational decision model, a rational decision maker is one who, when confronted with a decision problem, makes the choice (decision) that is best or optimal in some well defined sense – for example, expected utility maximization (Lee, 1971, 7).

A rational decision-making model describes a sequence of logical steps taken to chose a particular course of action. Heracleous (1994, 17) suggested that the steps should include the identification of a problem, the identification of objective criteria to evaluate alternatives, a search for alternative solutions, objective evaluation of the alternatives and implementation and monitoring of the chosen course of action. If these steps are followed then it can be said that a rational-decision making model has been followed to arrive at a decision.

Decision Making Issues in Economic Theory

As economics is *"the science that describes and predicts the behaviour of several kinds of economic human"* (Simon, 1959), it is assumed that "economic humans" are rational beings and interested in an increase in well-being. Economic analysis rests upon the fundamental assumption that the behaviour of individuals is driven by the pursuit of their own egotistical ends (Mueller, 1984) which is often referred to as "instrumental" behaviour. Economics is also a science that focuses on the allocation of scarce

resources; it is in the allocation of these scarce resources that financial decision problems occur. Decision making is essentially resource allocation.

Neo-Classical Economic Theory

The concept of an economic man making rational choices is at the center of neo-classical economic theory (Reiter, 1994). To explain decision behaviour, economic theory postulates that consumers should seek to maximize utility (to the individual). Normative theory also holds that the process of making a decision should conform to a set of axioms that ensure that the individual's maximum expected utility is derived from the decision outcome (Brown & Solomon, 1987). The assumption is that it is only by maximizing expected utility that an individual can make an optimum and rational choice. This rational, utility-maximizing individual is often referred to as "Homo Economicus" in the economic literature (Marsden, 1984).

The rational decision-making model, therefore, proposes that *all people,* in whatever situation, should evaluate potential events— or alternative choices— in terms of the overall effect on total wealth or utility (Schwartz, 1998). The normative models for decision making contained within neo-classical economics attempt to explain not only the behaviour of individual decision makers and groups of decision makers, but also to explain decisions made on behalf of the firm. When considering the welfare of the firm, utility maximization equates to maximizing wealth, or present value (Van Horne, 1992).

Decision Making in Economic Theory

The underpinning assumption of economics is that resources of decision makers, no matter how ample they may be, are always limited— that is, virtually all resources are considered to be scarce (Baumol & Blinder, 1982, 38). Therefore, choices are made among a limited set of possibilities and *"a decision to have more of one thing means we must give up some of another"* (Baumol & Blinder, 1982, 39). There are two sets of basic principles for choice under neo-classical economics: methodological individualism and rational choice (Boland, 1998, 516).

Methodological individualism holds that only individuals, not things, can make choices. This restricts the list of acceptable exogenous (explanatory) variables. Under neo-classical economics— as opposed to classical economics— rational choice is represented by a mathematical notion of constrained maximization (Wakker, 1993). The implication is that once the objective function to be maximized is specified, anyone facing the same constraints and maximizing according to the objective function should make the same unique choice (Boland, 1998, 517). This assumes that each individual will use the same cost information to come to the same unique choice. The unknowns that are faced in making these decisions are described as "risk" and "uncertainty". The degree of risk also affects the decision outcome

Relevant Costs in Decisions

It is essential that the decision maker correctly identify the economically relevant costs to arrive at the optimal solution (Besanko & Braeutigam, 2002, 260). From an economic perspective, the relevant cost involved in any decision is its opportunity cost (Baumol & Blinder, 1982, 39; Pindyck & Rubinfeld, 2001, 204; Colander, 2001, 6). Economists use the terms "economic cost" and "opportunity cost" synonymously. An example of an opportunity cost problem illustrates this point.

Example 2.1 (Opportunity Cost Problem)

An opportunity cost can be exemplified by the following (Pindyck & Rubinfeld, 2001, 204):

> A firm owns a building and therefore does not pay rent for office space. Does this mean that the cost of office space is zero? Financial accountants would consider this cost as zero.
>
> An economist would take into consideration that the firm could have earned rent on the office space by leasing it to another company. This rent foregone is the opportunity cost of utilizing the office space and should be included as part of the "economic cost" of doing business.

Decision Making in Expected Utility Theory

The foremost theory of decision making under risk is the expected utility model. This model is based on a set of axioms which provide criteria for the rationality of choices. The choices of an individual who conforms to the axioms can be described in terms of the "utility" of various outcomes for that individual. The utility is not a measure of the individual's satisfaction, but an index for consistent ranking of alternatives in accordance with observations and the implications of the axioms (Frank, 1998, 193; Schwartz, 1998, 40). When faced with a choice, a rational decision maker will, therefore, prefer the outcome that offers the highest utility (Elster, 1986, 125; Tisdell, 1996, 29). Individuals are assumed to act on the basis of their evaluation with respect to *"the effects on final wealth levels"* (Schoemaker, 1982, 550) in order to maximize their expected utility. Expected utility is concerned with comparisons between the present situation and the possible future outcomes of alternative courses of action; in this regard the past is deemed irrelevant for the purpose of decision making. All that is relevant is current wealth and future possible wealth states. How current wealth levels arose is of no concern to the model. By implication all sunk costs are irrelevant.

This argument can be put another way. The concept of expected utility in financial decision making starts with the assumption that an individual has at a particular moment in time, a given amount of wealth (an asset); the value of which is the current market value. The desired outcome is to invest the asset in a manner that will maximize future income streams from that asset. Expected utility theory suggests that *"alternatives are evaluated with respect to their effects on final wealth levels"* (Schoemaker, 1982, 550). A person's wealth is therefore measured in terms of the present, regardless of how it was derived— that is, wealth is measured as the market value at a particular point in time.

Only future or expected consequences are relevant to economic decisions (Heyne, 1997, 121). In the decision-making process, a person accepts the present situation (specifically wealth as measured according to the current market value) and focuses on the future in considering the rational choice and the risks involved. In other words, an individual makes the best of the current situation and its probabilities, no matter how uncertain the future may seem. A sunk cost is an expenditure that has been made and cannot be

recovered, as a result it is deemed irrelevant to decisions about the future (Pindyck & Rubinfeld, 2001, 207).

The term gamble or gambles is used in economics to describe *"...economic decisions made under uncertainty"* (Frank, 1998, 191). A model based on the idea that individuals maximize expected utility in selecting from among gambles is represented by the formula below (Demski & Swieringa, 1981, 34; Payne, 1985, 4; Ansic & Keasey, 1994, 185).

The expected utility of a given action A is represented by the formula:

$$EU(A) = \sum_{i} p_i \, U[x_i]$$

where $U[x]$ represents the utility of monetary outcome or "prospect" x_i, and p_i is the subjective probability of possible outcome i.

Accordingly, this formula implies that the value of a lottery or gamble depends on the money value of the prizes and the associated probabilities of each potential outcome. The logic underlying this approach provides no role for past events— especially sunk cost— to be applied to the current decision. A risky prospect (action) is one in which the decision maker is not sure which outcome will occur (Shapira, 1995, 4). Accordingly, the utility of a risky prospect is equal to the expected utility of its outcomes— obtained by weighting the utility of each possible outcome by its probability (Ansic & Keasey, 1994). As the focus of the utility calculation is concerned with future possibilities, a sunk cost is *"irrelevant in weighting the future consequences of the current decision"* (Bornstein & Chapman, 1995, 251). A prospect is a course of action that yields a particular outcome (Kahneman & Tversky, 1979, 263).

Sunk Cost in Economic Decision Making

The principle of ignoring sunk cost (or sunk capital) is generally implicit in most microeconomic literature and textbooks. The term "sunk capital" in microeconomics is defined as *"...that capital...not capable of being put to alternative uses"* (Dewett, 1963, 132). Sunk costs, according to economic textbooks (Frank & Glass, 2000; McEachern, 1997; Terry & Forde, 1984) are related to resources that have been committed and subsequently cannot be reversed— for example, investments in plant and equipment or land and buildings.

The Problem of Sunk Cost

A review of early microeconomic textbooks undertaken by Wang and Yang (2001) pointed out the term "fixed costs" was mistakenly used to refer to "unavoidable costs" or sunk capital. Wang and Yang referred to this as mistaken because fixed costs in accounting terms are deemed to be necessary costs for production and decisions concerning continued production. As such these include future elements. In contrast, sunk costs are not relevant because they are already incurred and cannot be reversed (Mas-Colell, Whinston & Green, 1995).

Example 2.2 Sunk Cost Decision 1

> A typical every day event that typifies the concept of a sunk cost occurs at the supermarket check-out. First how do you decide which queue to join? I venture to say that you pick the queue that you think will take you the least time to get served.
>
> Now suppose that after waiting in line for ten minutes you realise that another queue has moved more quickly and is now much shorter than yours. Do you switch queues? Or do you think, 'I've already spent 10 minutes in this queue so I'm going to stay in it'? The 10 minutes spent in the queue represents a sunk cost, which is a cost that cannot be recovered whatever you do. Accordingly, such costs should be ignored when evaluating alternative courses of action and making economic decisions.
>
> Source: (Adapted from Quayle, Robinson & McEachern, 1994, 29)

A more complex example of a decision task with a sunk cost involves a decision of whether to drive or take a bus for a long journey.

Example 2.3 Sunk Cost Decision 2

> Suppose you are planning a 250 kilometer trip to Sydney. Except for the cost, you are completely indifferent between driving and taking a bus. Bus fare is $100. You don't know how much it would cost to drive your car, so you call Hertz for an estimate. The Hertz representative tells you that for your make of car, the costs of a typical 10,000 kilometer driving year are as follows:

Insurance	$1,000
Interest	2,000
Fuel & Oil	1,000
Maintenance	1,000
Total	$5,000

> You calculate that these costs come to \$0.50/kilometer and use this figure to compute that the 250 kilometer trip will cost you \$125 by car. Since this is more than the \$100 bus fare, you decide to take the bus.
>
> If you decide in this fashion, you commit the error of counting sunk costs. Your insurance and interest payments do not vary with the number of kilometers you drive each year. Both are sunk costs and will be the same whether or not you drive to Sydney. Of the costs listed, fuel and oil and maintenance are the only ones that vary with kilometers driven. These come to \$2,000 for each 10,000 kilometers you drive, or \$0.20/ kilometer. Therefore at \$0.20/ kilometer, it costs you only \$50 to drive to Sydney, and since this is much less than the bus fare, you should drive.
>
> Source: (Adapted from Frank & Glass, 2000, 13)

The assumption in this example that you are indifferent between the two modes of transport is an important issue in the decision process. This means that the only comparison that matters is the actual cost of the two choices. If you had preferred one choice to the other, a weighting would be necessary for that preference. For example, if you were willing to pay \$60 to avoid the hassle of driving, the real cost of driving would be (\$50 plus \$60) or \$110, not \$50, and you should take the bus.

Sunk Cost Defined in Microeconomics

Table 2.1, depicting the historical development of sunk cost in the microeconomic literature, reveals that discussion of sunk costs is only included in the most recent editions of microeconomic textbooks. The discussion is generally limited to the axiomatic statement that *"past costs are irrelevant for future investment decisions"*. It is therefore simply assumed that individuals, if behaving rationally, ignore sunk costs. A consistent theme in the definitions is the notion that sunk costs are "irrevocable" (that is, they cannot be recovered).

Table 2.1
Sunk Cost Defined in Microeconomic Textbooks 1977-2001

Textbook Details	*Sunk Cost ~ definition*
Calvo & Waugh (1977)	No
Koutsoyiannis (1979)	No
Calvo & Waugh (1980)	No
Quirk (1983)	No
Freeman (1983)	No
Zamagni (1987)	No
Kreps (1990)	No
Gravelle & Rees (1992)	No
Pindyck & Rubinfeld (1992)	Ch 7 p.199 " A sunk cost is an expenditure that has already been made and cannot be recovered."
Prager (1993)	No
Jackson, McIver & McConnell (1994)	No
Mas-Colell, Whinston & Green (1995)	Ch 5 p.131 " if some production decisions have been made, or if irrevocable contracts for the delivery of some inputs have been signed, inaction is not possible."
McTaggart, Findlay & Parkin (1996)	Ch 9 p. 203 "A sunk cost is the dollar cost of buying plant and equipment that have no current resale value."
Frank (1998)	Ch 1 p.12 "costs that are beyond recovery at the moment a decision is made."
Pindyck & Rubinfeld (2001)	Ch 7 p.205 " A sunk cost is an expenditure that has already been made and cannot be recovered."

The analysis of the microeconomic textbooks indicates that changes in the issues examined, such as the inclusion of sunk costs and discussion of decision making, were made after the mid 1990s. These concepts were implicit and now are often explicit within microeconomic theory and provide the foundation for defining costs in management accounting.

Decision Making Issues in Finance

Investment decisions involve committing a resource, usually cash, at one point in time with the expectation of deriving economic benefits at some future point in time (Levy & Sarnat, 1986, 16). A primary example is the acquisition of capital assets. Rational decisions involving investment of a capital nature are generally based upon the notion

that managers are expected to maximize the firm's economic profit (Peirson, Bird & Brown, 1986, 8).

Economic profit, unlike accounting profit, is measured by changes in the value of the firm and takes into consideration the opportunity cost of capital (Frank, 1998, 337). Accordingly, maximizing economic profit is consistent with the objective of maximizing the shareholders' wealth (Van Horne, 1992, 6; Begg, Fischer & Dornbusch, 1987, 119). Therefore, the most appropriate methods of investment appraisal should ensure that shareholders' wealth is maximized. Within the finance discipline (Kolb, 1988, 430), the market value is held to be the amount that could be realised (opportunity cost) for the particular good or resource if it was not being used in the present investment.

Investment Appraisal Methods

Finance textbooks and management accounting textbooks predominantly refer to investment appraisal methods within the scope of specific categories. These categories generally range from simple rules of thumb (such as payback and accounting rate of return) to more mathematically sophisticated methods such as internal rate of return and net present value. The categories and their relevant associated methods are detailed in Table 2.2.

Table 2.2
Investment Appraisal Methods

Method	*Definition*	*Assumptions*	*Advantages*	*Limitations*
Accounting Rate of Return	Ratio of average annual net income to the initial investment or average investment (book value).	1. Effect on company accounting earnings relative to average investment in a project is a key consideration. 2. Size and timing of investment cost, project life, salvage value, and increases in earnings can be accurately predicted.	1. Data readily available. 2. Consistent with other financial measures.	1. Ignores timing and time value of money. 2. Uses accounting numbers rather than cash flows.
Payback Period	Number of years to recover the initial investment.	1. Speed of investment recovery is the key consideration. 2. Timing and size of cash flows are accurately predicted. 3. Risk (uncertainty) is lower for a shorter payback project.	1. Simple to use and understand. 2. Measures liquidity. 3. Allows for risk tolerance.	1. Ignores timing and time value of money. 2. Ignores cash flows beyond payback period.
Net Present Value	Difference between the initial investment and the present value of subsequent net cash flow returns discounted at a given interest rate.	1. Discount rate used is valid. 2. Timing and size of cash flows are accurately predicted. 3. Life of project is accurately predicted. 4. If the shorter-lived of two projects is selected, the proceeds of that project will continue to earn the discount rate of return through the theoretical completion of the longer-lived project.	1. Considers time value of money. 2. Uses realistic discount rate for reinvestment. 3. Additive for combined projects.	1. Not meaningful for comparing projects requiring different amounts of investments.
Internal Rate of Return	Discount rate that makes the initial investment equal to the present value of subsequent net cash flow returns.	1. Hurdle rate used is valid. 2. Timing and size of cash flows are accurately predicted. 3. Life of project is accurately predicted. 4. If the shorter-lived of two projects is selected, the proceeds of that project will continue to earn the IRR through the theoretical completion of the longer-lived project.	1. Considers time value of money. 2. Easy for comparing projects requiring different amounts of investment.	1. Assumption on reinvestment rate of return may be unrealistic. 2. Complex to compute if done manually.

Source: (Adapted from Blocher, Chen & Lin, 1999, 418; Raiborn, Barfield & Kinney 1999, 356)

Finance theory implicitly treats sunk costs as irrelevant to the evaluation of financial decision choices. This is most evident in the treatment of decisions concerning investment or project evaluation. Financial textbooks recommend the use of net present values or other measures of future cash flow (or income) streams for decision-making purposes (Robichek & Van Horne, 1967; Dyl & Long, 1969; Boinini, 1977; Gaumnitz & Emery, 1980; Howe & McCabe, 1983). Concepts integral to finance used to define decision making are the time frame and the relationship between time and money.

Empirical research demonstrates that there are four predominant methods used in practice to evaluate investment opportunities. In a recent survey in the United States of America involving 392 corporate finance officers, Graham and Harvey (2001), found that large firms relied heavily on present value techniques and the capital asset pricing model while small firms tended to use the payback approach. These findings are consistent with prior research that focused on large firms. Details of the prior research findings are summarized in Table 2.3.

Table 2.3
Prior Research Findings on Investment Appraisal Methods by Large Firms

Evaluation Technique	*Klammer 1972 *(1969)*	*Gitman & Forrester 1977*	*Kim & Farragher 1979*	*Klammer, Koch & Wilner 1988*	*Farragher, Kleiman & Sahu 1999*
Discounted cash flow	57%	74%	68%	86%	78%
Accounting ROI	26%	28%	8%	4%	34%
Payback	12%	10%	12%	5%	52%

* Survey conducted 1969 results published 1972.

The capital budgeting decision process is further complicated in industries where uncertainty exists with regard to future organisational direction. A prime example of this is the Health Sector. By comparison with large corporate organisations, surveys of investment appraisal methods used in the Hospital Sector demonstrate that the payback method is the preferred method. Hospitals face the situation that both government and health care funds dramatically influence future revenue flows (Campbell, 1994). Table 2.4 presents a summary of the findings of prior research undertaken in the Hospital Sector.

Table 2.4
Prior Research Findings on Investment Appraisal Methods by Hospitals

Evaluation Technique	*Cleverley & Felkner 1982 n=87*	*Kamath & Elmer 1989 n=118*	*Kamath & Oberst 1992 n=94*
NPV	21%	22%	22.6%
IRR	*	16%	17%
Accounting ROI	3%	4.4%	7.5%
Payback	34%	26.5%	29%
Some other method	25%	31.1%	16.4%
No method	17%	-	7.5%

* data expressed as "discounted cash flow method" is included in NPV

Discussion of Investment Appraisal Methods

Capital Budgeting

Maximizing the net present value of the firm is the objective of capital budgeting (Peirson & Bird, 1976, 33). Capital budgeting is the process of evaluating long-term investment proposals (Raiborn, Barfield & Kinney, 1999, 342). Burke (1970) provides examples of capital budgeting applications and practice. A more rigorous discussion of issues and problems associated with capital budgeting constructs and techniques is found in Anthony (1960) or King (1975). The models for decision making in use by the finance discipline are consistent with the notion that sunk cost information is irrelevant in making a rational decision and focus only on net present value and current market value.

Capital budgeting decisions are among the most important of all management decisions because they impact on an organisation's future (Smith, 1994). These decision techniques are based on the microeconomic theory of the firm (Dyl & Long, 1969) which posits that companies are profit motivated (Peirson & Bird, 1976, 29). Pierson and Bird (1976, 28) suggested that the most suitable objective for financial decision making is *"... the maximization of the market value of a company to its shareholders."* Subsequently, for investment decisions, the criterion becomes one of selecting the project that has the most favourable effect on the company's share price.

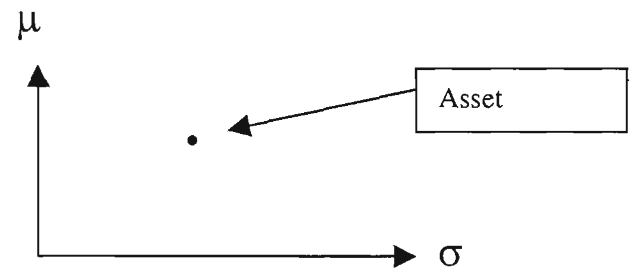
A distinguishing feature of capital investment decisions is the consideration of the time value of money. As a typical capital investment decision invariably involves the comparison of present cash outlays to future benefits, problems relating to the timing of receipts and outlays are central to capital budgeting analysis. Capital budgeting evaluation is concerned with comparing the expected future cash flows from the prospective investment projects. The quantitative methods most favoured by the finance discipline are the discounted net cash flow techniques: net present value and the internal rate of return (Peirson & Bird, 1976,77; Levy & Sarnat, 1986, 202). Note that as in expected utility maximization, past cash flows (sunk costs) are not considered.

Portfolio Theory

While net present value is the preferred method to determine the feasibility of capital expenditures, investment in financial securities requires an approach that acknowledges the diverse nature of the share market. The method prescribed in finance textbooks to resolve this difference in scale and duration of alternative investment in securities is the portfolio approach (Levy & Sarnat, 1986). Portfolio theory assumes that all investors are risk-averse and therefore prefer to avoid risk whenever possible (Markovitz, 1952; Kolb, 1988). This implies that an investor requires compensation in the form of greater return on investment for bearing risk (Kolb, 1988).

Portfolio theory also assumes that all assets are included in the formula at market value. Essentially, the original cost of the asset is irrelevant in the decision process and by inference sunk costs are also irrelevant. An assessment of the portfolio theory model is presented in Figure 2.1. The composition of a portfolio suggested by the model is based entirely on the relationship between the forecast mean return μ and the forecast volatility σ. Past prices, in particular actual costs, are irrelevant.

Figure 2.1
Portfolio Theory Model



(μ,σ) represents the asset

σ represents the standard deviation (volatility) or risk

μ represents the mean of R_t where

One period away

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Price now at start of period

R_t is the expected rate of return (or cost of capital) in period *t*.

P's are current asset prices.

The main point is that only the forecast R_t is taken into account in decision making using portfolio theory. Past returns *per se* are not relevant (apart from their use in forecasting future returns).

Return on Investment

In finance textbooks, return on investment (ROI) is consistently based on the current market value of the asset (Brealey & Myers, 1988; Bishop, Crapp & Twite, 1985, 70; Kolb, 1986, 7). This is so whether or not the asset is an item of plant, equipment, land, building or shares in a company. This approach treats past costs as irrelevant. Historical costs are the primary basis for measuring the value of assets under financial accounting methods. However, in finance, historical costs are by definition irrelevant for financial decision making. The rejection of historical cost for evaluation of an investment or project in finance textbooks suggests that analysis based solely on accounting data may well lead to a choice that is not optimal for the firm in terms of maximizing wealth.

Sunk Cost in Finance

The discussion of sunk cost in finance textbooks is generally focused on the notion of *"outlays or outflows"* as distinct from management accounting textbooks which focus on the notion of "*past costs*". Table 2.5 reviews the historical development of the treatment of sunk cost in finance textbooks from 1976 to 2000.

Table 2.5
Sunk Cost Defined in Finance Textbooks 1976-2000

Textbook Details	*Sunk Cost ~ definitions*
Peirson & Bird (1976)	No
Bishop, Crapp & Twite (1985)	No
Peirson, Bird & Brown (1986)	No
Kolb (1988)	Ch 14 p. 430 "A cost that has been incurred previously and cannot be recovered is known as a sunk cost."
Brigham & Gapenski L.C. (1988)	Ch 9 p. 291 "A sunk cost refers to an outlay that has already occurred (or been committed), so it is an outlay that is not affected by the accept/reject decision under consideration."
Brealey & Myers (1991)	Ch 6 p. 95 "[Sunk costs] are past and irreversible outflows. ... they cannot be affected by the decision to accept or reject the project, and so they should be ignored."
Campsey & Brigham (1991)	Ch 14 p. 511 "A sunk cost is an outlay that has already been committed or that has already occurred and hence is not affected by the accept/reject decision under consideration."
Bishop, Crapp, Faff & Twite (1993)	Ch 9 p.228 "Since the NPV of a project is concerned with estimating the change in the value of the firm as a result of accepting the project, past cash flows are irrelevant for this purpose; sunk costs are irrelevant."
Brigham & Gapenski (1993)	Ch 8 p. 263 "A sunk cost refers to an outlay that has already occurred (or been committed), so it is an outlay that is not affected by the accept/reject decision under consideration."
Brealey, Myers, Partington & Robinson (2000)	Ch 6 p. 133 "[Sunk costs] are past and irreversible outflows. Because sunk costs are bygones, they cannot be affected by the decision to accept or reject the project, and so they should be ignored."

The historical review of finance textbooks indicates that changes in the portrayal of investment appraisal methods occurred after the late 1980s when sunk costs were included in decision-making discussions. A consistent theme in the definitions of sunk cost presented in Table 2.5 is that sunk costs are *"already committed and cannot be affected by the decision"* (that is, they cannot be changed whatever the decision). In other words, sunk costs have no effect on the decision choices that lie in the future.

Implications Regarding Sunk Cost in Finance Models

From the perspective of the finance models, there is an implicit suggestion that to ignore sunk costs is normal rational behaviour. Sunk costs are basically ignored in the discussion and formulation of the decision-making models in finance textbooks. To illustrate the fact that net present value calculations treat sunk costs as irrelevant, Example 2.4 is presented and examined (Bishop et al., 1993, 241).

Example 2.4 (Capital Budgeting Problem)

Replace Equipment

Example:

A firm is considering the installation of a new machine to replace an existing machine. Corporate tax is 40% and the new and old machines each have an expected salvage value of zero at the end of ten years. The required rate of return appropriate for each alternative is 10% per annum. The estimated cash flows are:

	Existing Machine	**New machine**	**Incremental Cash Flows**
Cost	0	-70,000	-70,000
Annual net cash outflows	-30,000	-10,000	20,000
Annual depreciation	3,000	7,000	4,000
Current salvage value	10,000		10,000
Tax saving on disposal	8,000		8,000
Life	10 years	10 years	

Solution:

Incremental cash flow = (20,000 x 0.60) + (4,000 x 0.4)
= \$13,600 per period

The NPV of the change will be:

$$\text{incremental } NPV = -70{,}000 + 10{,}000 + 8{,}000 + \sum_{t=1}^{10} \frac{13{,}600}{(1.10)^t}$$
$$= -52{,}000 + 13{,}600(6.145)$$
$$= \$32{,}572$$

Comment:

Since this net present value is positive, the new machine should be preferred to the old. As the existing machine is already in place, it is necessary to compute the incremental cash flows associated with accepting the new machine to determine the change in net operating cash flows after corporate tax.

The point worth noting in this example is that the historic cost of the existing machine, that is the sunk cost, is ignored in evaluating its continued use. However, the market value of the existing machine is a valid cash flow in the consideration of changing to a new machine. Cash flow analysis is a major theme in finance models and is linked to the concept of "*economic value... as ... a measure of wealth*" (Bazley, Hancock, Berry & Jarvis, 1999, 64). The argument rests on the principle that the economic value of any item, such as the machine in Example 2.4, is best represented by the expected future income stream to be derived from using that particular item. Under this approach wealth is measured in terms of the present day value of the expected future income stream which is discounted at an appropriate rate (Bazley, Hancock, Berry & Jarvis, 1999, 64).

Decision Making Issues in Management Accounting

Accounting research has traditionally focused on identifying the most useful information for decision makers without considering what type of information may be irrelevant and not useful for decision making (Shiozawa, 1999). Practically all management accounting research is concerned with how individuals evaluate choices from among alternatives. This research assumes that individuals will process information as if they wish to maximize expected utility in terms of profit maximization or cost minimization (Feltham & Demski, 1970). The flow of economic concepts throughout management accounting is also evident in a pervasive focus on cost minimization and profit maximization (Shiozawa, 1999).

Rational Choice in Management Accounting

In management accounting, rational choice models are based on the economic concepts of marginal cost and wealth maximization (Scapens, 1991). The prescriptions for decision making in the discipline of management accounting are therefore reliant on the neo-classical view of rational choice as found in neo-classical and microeconomic theory discussed earlier in this chapter.

Relevant Costing Derived from Economics

The concept of relevant costs prevalent in the management accounting textbooks (Horngren & Foster, 1991; Hansen & Mowen, 2000) can be traced to the economic argument that only expected *future* costs that can be expected to differ between

alternatives are relevant to decision making (McEachern, 1997; Terry & Forde, 1984; Frank, 1998). Past or historical costs cannot be affected by any current decision and are therefore irrelevant to that decision.

Sunk Costs Defined in Management Accounting

Management accounting textbooks inevitably devote whole chapters to identifying and classifying costs and cost behaviour. Most decision models used in management accounting texts are founded upon neo-classical economic constructs. There are many types of decisions that managers face in the course of operating a business. From the potentially diverse number of issues there are two that are particularly linked to the neo-classical economic rational view: the production decision and the investment decision. The management accounting tools or techniques associated with these specific management decisions are presented in Table 2.6.

Table 2.6
Management Accounting Decision Techniques

Management Decision	*General Technique*	*Specific Technique*	*Underlying Constructs*
Output or production e.g. • make or buy; • select production level of products; • produce beyond split off	Return on investment; Break-even analysis; Cost-volume profit analysis	Contribution margin analysis; Differential analysis; Incremental analysis.	Sunk costs irrelevant; Opportunity costs relevant; Future revenues relevant.
Investment and disinvestment	Return on investment; Pay back methods	Discounted cash flow techniques; Sensitivity analysis; Risk analysis using objective or subjective probabilities; Differential analysis; incremental analysis.	Sunk costs irrelevant; Opportunity costs relevant; Future revenues relevant.

There is little research that explicitly addresses or demonstrates the irrelevance of sunk cost to the financial decision-making process. The arguments pertaining to sunk cost are largely axiomatic and presumed self evident. Banker, Data and Kekre (1988) made the point that conventional management accounting principles tend to assume deterministic manufacturing environments when evaluating relevant costs of adding or deleting products. Kaplan (1983) suggested that the simplistic traditional management

accounting models were not applicable to the evolving complex manufacturing operations and service organisations.

Table 2.7 presents an overview of the definitions of sunk cost in management accounting textbooks, revealing that discussion of sunk costs appears consistently throughout the editions from 1977 to the present. Unlike the micro-economic textbooks, the discussion is not limited to the axiomatic statement that *"past costs are irrelevant for future investment decisions."* In addition, the nature of rational decision making is conceptualized in terms of the relevant costs and revenues.

Table 2.7
Sunk Cost Defined in Management Accounting Textbooks 1977-2001

Text Author	*Sunk Cost ~ definitions*
Horngren (1977)	Ch 11 p 357 "a past cost that is unavoidable because it cannot be changed no matter what action is taken."
Moriarity & Allen (1987)	Ch 5 p.222 "A sunk cost is a cost that has been incurred in the past and cannot be changed."
Rayburn (1989)	Ch 18 p.911 "Sunk costs ... are historical expenditures for equipment or other productive resources which have no economic relevance to the present decision-making process."
Horngren & Foster (1991)	Ch 11 p.368 "Past costs that are unavoidable because they cannot be changed no matter what action is taken."
Maher (1997)	Ch 14 p.418 "an expenditure made in the past that cannot be changed by present or future decisions."
Horngren, Sundem & Stratton (1996)	Ch 5 p. 168 "A cost that has already been incurred and, therefore, is irrelevant to the decision making process."
Horngren, Foster, Datar, Black & Gray (1996)	Ch 11 p.419 "Past costs that are unavoidable because the past cannot be changed no matter what action is taken."
Raiborn, Barfield & Kinney (1999)	Ch 6 p.242 "Costs incurred in the past to acquire an asset or a resource – called sunk costs – are not recoverable and cannot be changed, regardless of what current circumstances exist or what future course of action is taken. A current or future selling price may be present for an asset, but that is the result of current or future conditions and is not a recouping of an historical cost."
Blocher, Chen & Lin (1999)	Ch 3 p.73 "Sunk costs are costs that have been incurred or committed in the past, and are therefore irrelevant."
Weygandt, Kieso & Kimmel (1999)	Ch 9 p.346 "Costs that have already been incurred and will not be changed by any future decision."
Hansen & Mowen (2000)	Ch17 p. 688 "Sunk costs are past costs. They are always the same across alternatives and are, therefore, always ir relevant."
Jiambalvo (2001)	Ch 6 p.202 "Costs that are sunk (i.e. already incurred and not reversible) are never incremental costs, because they do not differ among the decision alternatives. Therefore, they are not relevant in making a decision.

A consistent theme in the definitions presented in Table 2.7 is the idea that sunk costs are *"past expenditures or undertakings that cannot be changed regardless of which choice is made"* (that is, they are historical by nature, cannot be recovered, and have no bearing on the present decision). The concept of sunk cost in management accounting is more diverse than in microeconomic textbooks and more detailed than in finance textbooks.

Applying Sunk Cost in Management Accounting

Sunk costs, according to accounting textbooks, are resources that have been committed and subsequently cannot be reversed— for example, most fixed overhead costs such as rent (Horngren & Foster, 1991; Hansen & Mowen, 2000). To illustrate this point, the following make-or-buy example was derived from Maher (1997, 443). The method used to determine the optimal outcome is differential analysis.

Example 2.5 (Make or Buy Problem)

Make-or-Buy Decision 1

Net Minder Manufacturing produces tennis rackets. It currently makes a cover for each racket at the following cost:

	Per unit	**10,000 units**
Costs that can be directly assigned to the product:		
Direct materials	$2.00	$20,000
Direct labour	1.00	10,000
Variable manufacturing overhead	0.75	7,500
Fixed manufacturing overhead		2,500
Common costs allocated to this product line		15,000
		$55,000

Normal production is 10,000 units, so the full product cost is $5.50 ($55,000/10,000).

Net Minder has received an offer from an outside supplier to supply any desired volume of covers for $4.10 each.

Solution:

	Make (Status Quo)	Buy (Alternative)	Difference
Direct Costs			
Direct materials	$20,000	$41,000	$21,000 higher
Direct labour	10,000	0	10,000 lower
Variable overhead	7,500	0	7,500 lower
Fixed overhead	2,500	0	2,500 lower
Common costs	15,000	15,000	0
Total Costs	$55,000	$56,000	$ 1,000 higher

Comment:

In this situation the alternative to making the covers will cost the firm more and therefore the alternative is not acceptable. As the analysis shows that the buy option causes $1,000 more in costs, the rational decision should be to continue to "make".

Applying Opportunity Cost in Management Accounting

When making choices, a decision maker is confronted with having to forego one or more alternative courses of action. An example of early developmental work on the theory of opportunity costs is found in Eiriksson (1954). Opportunity costs are defined generally as *"those benefits which could have been received had an alternative course of action been chosen"* (Thompson, 1973, 263). McEachern (1997) made the point that when people say that they *"had nothing better to do",* they are implying that they had no alternatives more attractive so they are sacrificing very little in undertaking the chosen activity. In other words, they evaluate their action in accordance with an expected utility and make their choices in a rational manner.

To illustrate the concept that opportunity costs are relevant to the determination of the most optimal outcome, Example 2.6 continues the scenario from Example 2.5 with the inclusion of opportunity costs. The addition of opportunity costs in the scenario changes the outcome of the analysis and the "buy" option becomes the optimal choice (Maher, 1997, 443).

Example 2.6

Make-or-Buy Decision 2 ~ with opportunity costs

Additional Information (opportunity cost):

Assume that the facilities to make the covers could be used to assemble a cheaper version of the racket that Net Minder presently produces. This cheaper version would provide a $4,000 contribution. The opportunity cost of using the facility to make covers is therefore $4,000.

Revised Solution:

	Make (Status Quo)	Buy (Alternative)	Difference
Total Costs	$55,000	$56,000	$ 1,000 higher
Opportunity cost of using facilities to make covers	4,000	0	4,000 lower
Total costs, including opportunity cost	$59,000	$56,000	3,000 lower

Comment:

By taking into consideration the opportunity cost, the firm is able to obtain a further $3,000 contribution to income. The rational decision should be to "buy".

The addition of opportunity costs in the scenario changes the outcome of the analysis and the "buy" option becomes the optimal choice.

The proposition that individuals act rationally and always select the optimal alternative implies the existence of an opportunity cost in the comparison of choice between alternatives. This proposition ignores the potential for other logical possibilities to explain the behaviour of the decision maker, who seldom know the actual value of the foregone alternative (McEachern, 1997, 27). Further, the assumption that the decision maker has all the relevant information is questionable because acquiring information about alternatives is often costly and time consuming. As a result, individuals usually make choices based on limited or even incorrect information (McEachern, 1997, 27).

Comparison with Financial Accounting

According to management accounting textbooks, management accounting is future orientated while financial accounting is concerned with the past (Horngren & Foster,

1991). Financial accounting data is based on historical cost— for example the book value of an asset is the historical cost less any accumulated depreciation— and this is the sunk cost (Brealey & Myers, 1988). Decision making based on financial accounting data will include sunk costs and this is normatively incorrect. Historical cost is used in the accounting rate of return method to analyse investment projects (Brealey & Myers, 1988, 264; Horngren, Foster & Datar, 1994, 701). The accounting rate of return method is criticized for ignoring the time value of money and, more importantly, for treating sunk costs as relevant to decision making.

Errors of Historical Costs

The use of historical cost, derived from financial accounting records, leads to the common mistake of including sunk costs in the decision making analysis. An example that typifies the erroneous use of historical cost is the simple evaluation of an investment property. This conversation is typical of much discussion among investors, and even among qualified accountants.

Example 2.7 Historical Cost Decision Error

> "I bought my investment property in 1984 for $200,000 and the annual rent is $30,000 so the rental yield is 15% ($30,000/$200,000). That's better than I can get by investing anywhere else, so I am very happy with the property."
>
> However, the current market value for property in the same area is $600,000. The market value represents the opportunity cost that is being foregone. That is, should the person choose to sell the property he/she would have $600,000 to reinvest. Therefore, the appropriate rental yield should be taken as 3.33% (30,000/600,000), which is not such a good return. This measure is logically comparable with yields on alternate investments (for example, current bank interest rates).

The historical cost (financial accounting method) involves a sunk cost (a price paid in 1984) which is irrelevant for the purpose of current analysis. The example shows that reliance on historical cost (sunk cost) is misleading in determining wealth at a given point in time.

Summary of Normative Decision Models

Consistency between Disciplines

The term sunk cost has significant meaning and a long history in management accounting as well as for cost analysis in economic and finance theory. A sunk cost is defined and treated similarly across the disciplines of economics, management accounting and finance. That is, a sunk cost is an irrevocably committed resource or asset that cannot be changed and is therefore irrelevant to future activities. As such, sunk costs are not included in the process of rational decision making in these disciplines. However, it was apparent that sunk costs are still in use for decision making purposes among investors schooled in the conventions of financial accounting.

Same Basic Concept for Dealing with Sunk Costs

Normative decision-making theory prescribes that past costs are irrelevant to rational decision making. In the context of management accounting, the exclusion of sunk costs from decision making equates to the decision rule to maximize profit or minimize loss. The normative theory of decision making under risk is based on the expected utility model. This model consists of a set of axioms which provide the criteria for rational decision making. When faced with a risky set of options, a rational decision maker is expected to select the prospect that offers the highest expected utility.

The principle that sunk costs are irrelevant to decisions and that an optimal decision should be based on expected utility theory is inherent in the discipline of economics. Finance theory emphasises the relationship in terms of outlays or outflows and management accounting theory emphasises the relationship in terms of past costs. Adherence to the normative approach is evident in the methods and techniques prescribed in the various textbooks of these disciplines for decision making under sunk costs.

Chapter Summary

This chapter introduced the perspective of the normative model of rational decision making in which sunk costs are deemed to be irrelevant to economic decisions. From an economic perspective, rational behaviour is considered to follow a utility function.

Expected utility theory forms the basis for postulating how economic decisions should be made and what information should be relevant to the process of making choices. Sunk costs are held to be irrelevant to the decision-making process.

Decision models in finance follow normative economic decision theory and implicitly, rather than explicitly, are dismissive of sunk costs. Finance textbooks generally ignore the issue of sunk cost. However, sunk costs, when they appear, are consistently treated as irrelevant. Finance models necessitate the use of current market value and future cash flows which focus on opportunity cost to compare alternative courses of action (for example, investment projects). Common approaches to decision making in finance were discussed and shown to be logically consistent in their treatment of sunk costs as irrelevant.

The influence of normative economic decision theory within management accounting was demonstrated, particularly with regard to the treatment of sunk costs. Examples were used to highlight the normative approaches to common decision problems dealt with under management accounting. The examples serve to form the formal rational (theoretical) basis for the decision problems used in the empirical investigation reported in this thesis.

This review of the normative theory of sunk cost revealed that rational behaviour is predicated upon the treatment of sunk cost as irrelevant and only opportunity cost as relevant to economic decisions. Chapter 2 provides the foundation for the analysis of evidence concerning non-rational behaviour which is presented in Chapter 3.

CHAPTER 3
Behavioural Theories of Sunk Cost

Chapter Introduction

This chapter surveys the various competing theories that question the predictive capacity of the normative model of rational decision making. Frisch and Clemen (1994, 46) suggested that the *"central role of behavioural decision research is to evaluate the quality of people's decisions".* Behavioural research regarding decision-making behaviour focuses on examining people's preferences and identifying possible explanations for preference behaviour (Rabin, 1998). A number of researchers demonstrated empirically that human judgement and decision-making behaviour do not always follow the assumptions of the normative theories in expressing those preferences (Kahneman & Tversky, 1979; Arkes & Blumer, 1985). In view of the assumption of rationality in expected utility theory, this behaviour could be viewed as being "irrational" (Ellsberg, 1961).

In particular, anomalies are found when the circumstances of the alternative courses of action involve decision making under sunk costs (Thaler, 1980; Staw, 1981). This phenomenon has been labelled the "sunk cost effect". The sunk cost effect was first defined by Arkes and Blumer (1985, 124) as the individual's *"...tendency to continue an endeavour once an investment in money, effort, or time has been made."* Parayre (1991, 23) defined the sunk cost effect as *"the tendency to persist with a committed course of action beyond what economic rationality, based on marginal costs and benefits, would dictate."* Research by economists, accountants and organisational behaviourists found that decision makers tended to use sunk cost information (Becker, 1962; Arkes & Blumer, 1985; Awasthi & Pratt, 1990; Thaler, 1990) despite the clear normative prescriptions that *only* present and future costs should be used (Horngren, Foster & Datar, 1994). The sunk cost effect is also observed as occurring in personal and business decision making.

Whatever the behavioural origins of the sunk cost effect, it is reasonable to assume that it arises as a consequence of the decision-making process and therefore has a psychological element. In order to explore possible explanations for the sunk cost effect,

the behavioural models of decision making are reviewed in Chapter 3 across the categories of motivational, social learning and cognitive theories. From the review of cognitive theories, one model in particular provides an alternative framework to expected utility and rational decision theory. Prospect theory, due to its predictive capacity as a heuristic model of decision making, can account for irrational decisions. In the final part of the chapter, the research issues relevant to this dissertation are addressed.

Psychology of Decision Making

Psychology is defined as *"...the study of behaviour and experience pursued by methods, the status of which is continually under review"* (Ribeaux & Poppleton, 1978). One of the most significant contributions of psychology is its focus on the individual as a source of explanation of behaviour during the process of making decisions (Jennings & Wattam, 1998, 58). Beach (1990) suggested that there are three key approaches to research of the psychology of decision making. The first approach is prescriptive decision theory which assumes that the decision maker maximizes expected value. The second approach is behavioural decision theory which assumes that when the decision maker's cognitive processes are congruent with expected utility and probability theory, an optimal decision is achieved. The third approach is naturalistic theory which, whilst influenced by utilitarian prescriptions, recognises that decision makers encounter difficulty in comprehending events and tend to simplify matters. These latter behavioural approaches provide an alternative perspective to the simplistic notion that decision makers only maximize expected value.

The most common approaches to the study of the decision-making process are the study of rational decision processes and incremental decision processes. In the former, the decision-making process is taken as a whole and in the latter, the decision is seen as being derived from a number of decision points that cumulatively lead to the "decision" or "decision outcome". MacCrimmon and Taylor (1976) and Steers (1981) both describe the decision-making process as the procedures taken to select from available alternatives. Cohen, March and Olsen (1972) describe decision making as the solving of problems by matching options. Mintzberg, Raisinghani and Theoret (1976) suggested that the process should be analysed from the perspective of a particular setting where

individuals interact with specific issues. Confronted with an anomalous event, a decision maker is more likely to attempt to place the event in a context to derive meaning.

Economic theories are based on different models of the decision-making process than those held in psychology. Economics is primarily concerned with the mapping of the flow of inputs that result in choices. The view of the decision process in economics is that information is processed according to Bayesian statistical principles (perception of rationality), that preferences are primitive, consistent and immutable (preference rationality), and that the cognitive process is simply preference maximization subject to market constraints (process rationality) (McFadden, 1999). By contrast, the psychology of decision making is concerned with the nature of decision elements, how they are established and modified by experience, and consequently how they determine values. The dominant view of the decision process in psychology is that behaviour is local, adaptive, learned, dependent on context, mutable, and influenced by complex interactions of perceptions, motives, attitudes and affect (McFadden, 1999).

Behavioural Theories of Decision Making

Until the mid-1950s, little attention was given to explaining behaviour during the decision-making process. Edwards (1954) raised the issue of behaviour as a specific research concern in theory development for decision making. Allais (1953) recorded inappropriate decision-making behaviour in what is referred to as the "Allais paradox". The Allais paradox consists of two pairs of choices (prospects) with two alternative choices. For the first pair of choices, one prospect is a sure thing and the other is risky; the risky prospect has three possible outcomes. The following is an example of the first pair of choices (Li, 1994):

First Pair:

Prospect A	complete certainty of a good outcome	\$1m
Prospect B	.10 probability of a very good outcome	\$5m
	.89 probability of a good outcome	\$1m
	.01 probability of a bad outcome	\$0

The second pair of choices are obtained by eliminating the fixed chance of winning a specific amount from both prospects and are represented by the following example (Li, 1994):

Second Pair:

Prospect C	.11 probability of a good outcome	$1m
	.89 probability of a bad outcome	$0
Prospect D	.10 probability of a very good outcome	$5m
	.90 probability of a bad outcome	$0

Allias demonstrated that in the first pair of choices "A" was chosen most often. This choice is represented by the formula $.11u(1{,}000{,}000) > .10u(5{,}000{,}000)$. In the second pair of choices, "D" was chosen most often. This choice is represented by the formula $.11u(1{,}000{,}000) < 10u(5{,}000{,}000)$. This reverse inequality is a contradiction (paradox) and violates the "sure thing" principle.

Savage (1954) responded to Allais (1953) by maintaining that the *inappropriat*e human behaviour must be corrected as rational theory was soundly based. Savage's (1954) conclusions were that the normative theory provides a standard against which behaviour could and *should be* measured for correctness. Any inconsistencies were paradoxical and therefore should be corrected. This approach to behavioural findings contrary to normative theory is still contested (Keren, 1996). Further research to explain the breaches of normative theory resulted in a variety of behavioural theories of decision making. The behavioural decision-making literature has drawn on advancements in the cognitive information-processing paradigm (Keren, 1996).

Behavioural decision-making research has two main streams identified as the "motivational" and the "cognitive" disciplines (Heath, Larrick & Wu, 1999). In psychological terms, cognitive biases and motivational biases affecting decision making are considered to be different (Caplan, 2000). Motivational biases depend on the emotions of an individual, while cognitive biases refer to the thought processes involved (Nisbett & Ross, 1980). There are also behavioural explanations for decision making which rely on the psychological theories of social learning and reinforcement behaviour during the decision-making process.

Key Concepts in Behavioural Decision Making

Before considering the three types of behavioural decision-making theory, a number of key concepts of the psychology of decision making need to be defined and discussed: framing, experience, mental accounting, valence and the endowment effect. These concepts are all constructs used in operationalising the empirical investigation reported in this thesis.

Framing Effects on Decisions

The notion of a decision "framing effect" was introduced by Kahneman and Tversky (1979; 1982) as an extension of, and modification to, subjective expected utility theory. Subjective expected utility theory combines a subjective probability function with a utility function to represent risky preferences (Payne, 1985, 3). The decision frame was defined by these researchers as the *"set of issues that form a decision maker's conception of the problem"*. Research provided compelling evidence that the way individuals cognitively represent a particular decision problem (framing) has a strong influence on their preferences and the subsequent decision that is made (Tversky & Kahneman, 1981; Brewer & Kramer, 1986). Empirical research also demonstrated that decisions are affected by how outcomes are framed in the presentation of information to the decision maker (Kahneman & Tversky, 1979; Fagley & Miller, 1987; Miller & Fagley, 1991; Tversky & Kahneman, 1981; 1992).

The use of alternative wordings (positive or negative) for decision problems is "semantic framing". An example used to explain semantic framing is the metaphor of the glass which may be labelled as being either "half-full" or "half-empty" (Bazerman, 1990; Paese, 1995). Hartman and Nelson (1996) postulated that individuals' risk-taking behaviour differs depending on whether they perceive themselves to be in a "negative domain" or a "positive domain". When problems, choices or alternatives are framed in terms of losses, individuals tend to be risk-seeking. However, when the same problem is framed in terms of gains, individuals tend to be risk-averse.

Tversky and Kahneman (1981) suggested that just as changes in perspective can reverse the perceived relative apparent size of objects, imperfections of human perception are also responsible for the way individuals determine the relative desirability of options when making decisions. Bazerman (1984) replicated the experiments of Tversky and

Kahneman (1981) and found that subjects showed preferences for one alternative over another, despite identical utilities. Studies by Gilovich (1981) and Kahneman and Tversky (1984) showed that framing concealed the probabilities between alternatives while studies by Schurr (1987) and Metzger and Krass (1988) demonstrated that framing caused uncertainty among decision makers regarding preferences between alternatives.

Individuals are likely to have preferences derived from past experience (Kahneman & Tversky, 1984). Therefore, framing effects provide further evidence against the descriptive validity of utility theory. Framing effects challenge the principle of description invariance, which holds that the manner in which a situation is described should not affect one's decision (Frisch, 1993, 401). Tversky and Kahneman (1981) reported that they had obtained systematic reversals of preference by varying the framing of acts, contingencies, and outcomes over a variety of problems and with different groups of respondents. Whether the framing effect is evidence of an individual's limitations or the limitations of utility theory is still debated.

Machina (1987) conducted a review of research into decision making and offered two explanations for the reported deviations from expectations in terms of subjective expected utility theories of decision making. First, he suggested that the level of uncertainty regarding decisions diminished as individual decision makers acquired or learned through experience. In effect, a form of adaptive utility or induced preference accounts for particular observed framing effects. Second, framing effects were explainable as a special application of expected utility models. These findings were supported by the later review of framing effects by Kuhberger (1998), who found that framing was a reliable phenomenon and definitely an influence on decision making. Whilst these propositions offer alternative avenues for research, there appear to be no studies reporting such a focus.

Slovic, Fischoff and Lichtenstein (1982) applied the framing concept to analyse previous research findings on decision making. They suggested that the frame limited accessibility to data, causing the decision makers to use only information explicitly presented in the problem. Thus, in instances where relevant data had to be inferred, such data was largely ignored by the decision maker. Their second observation was that in

evaluating alternatives, decision makers deliberated on reasons to justify both the framing and their preferences in making the decision. Bierman (1989) found that subjects who received an explanatory note that highlighted the differences in probabilities made decisions that were more consistent with utility model expectations. Bierman (1989) also showed that subjects could be "immunised" against framing effects.

This finding introduced a possible new direction for research on framing effects. Prior research required subjects to be divided into two groups and then respond to different versions of a decision problem in order to establish the framing effect. Bierman's research required all subjects to respond to both versions of a decision problem, thereby examining the consistency of each individual's response as a means of determining the existence of any framing effect. Levin, Schneider and Gaeth (1998) reviewed the framing effect literature and proposed a typology to distinguish between three different kinds of framing: risky choice, attribute, and goal framing. The methodological differences that distinguish these three categories of framing manipulations are presented in Table 3.1.

Table 3.1
Risky Choice, Attribute and Goal Framing Manipulations

Frame Category	*What is Framed*	*What is Affected*	*How Effect is Measured*
Risky Choice	Set of options with different risk levels	Risk preference	Comparison of choices for risky options
Attribute	Object/event attributes or characteristics	Item evaluation	Comparison of attractiveness ratings for the single item
Goal	Consequences or implied goal behaviour	Impact of persuasion	Comparison of rate of adoption of the behaviour

Source: (Adapted from Levin, Schneider and Gaeth, 1998, 151)

Mental Accounting

Mental accounting (also referred to as "mental depreciation") is a form of decision framing in which individuals appraise the costs and benefits of outcomes (Thaler, 1980; 1985; 1999). Effectively, individuals form accounts (psychological accounts) regarding the advantages and disadvantages of an event or option. An example of how individuals

perform mental accounting was provided by Reid (1994, 99-100), who described a bad party he attended in his first year as a student at Harvard Business School.

> *Tickets were quite expensive ($60) and the party was unimpressive. The promised buffet was a meagre spread of cold cuts, the facilities were shabby, and the band uninspired. However, there was an open bar and this provided the impetus for a number of his classmates to seek to amortise the ticket price against the bar. "Have one drink and you paid $60 for it; have ten and they are only six bucks apiece", a far more reasonable price. I ran into a barely coherent guy in the men's room who claimed to have hit the $3.52 mark. "If I can put away three more beers before last call, then sixty bucks isn't a bad price," he said triumphantly.*

Historical costs, such as the ticket price, are sunk costs and should be ignored because they are not relevant. Heath and Fennema (1996, 95) observed that *"mental depreciation is likely to distort marginal decisions because when people spread the historical fixed cost they create a warped view of marginal costs and benefits."* Whyte (1986, 316) defined mental accounting as *"...an account which includes only the direct consequences of the act"* to explain the process by which individuals frame (evaluate) the cost of an action. However, research treats mental accounting as a separate issue to the framing effect. For example, Lipe (1993) examined the evaluation of performance from traditional variance analysis and presented a framework that suggested the cognitive impact on decisions was the result of both mental accounting and framing. This implies that mental accounting is a separate construct to framing and thus is in keeping with the explanation of the role of mental accounting.

Mental accounting describes a process of assessing advantages against disadvantages, which does not explain preference. By comparison, the framing of a particular decision is a matter of preference; in experimental settings it is the construct manipulated to influence the outcome of a decision. This sets the two constructs apart in so far as mental accounting is an explanation of an internal cognitive process and specific to an individual, while framing is manipulated on an external basis and thus is part of the experimental design or circumstances of the decision. The process of mental accounting is seemingly consistent with the theory of mental models of decision making.

Expertise and Experience

The concept that expertise and experience are contributing factors in decision making has received attention in the literature of business disciplines and the psychology of decision making. Klein et al. (1993) proposed a naturalistic paradigm of decision making, choosing to reject the strictly formal process in favour of an anthropological approach with observations in real settings. This new paradigm is referred to as "naturalistic decision making" and examines how experienced individuals make decisions in real-time situations.

Lesgold et al. (1988) examined the nature of expertise in diagnosing x-ray pictures. They found that experts were able to focus on critical areas of specific cases and disregard irrelevant information which novices related to in their diagnosis. Similarly, studies in auditing (Biggs & Mock, 1983; Bouwman, 1984; Biggs, Messier & Hanson, 1987) found that expert auditors used strategies to acquire relevant information compared to novice auditors who examined information sequentially, thereby exposing themselves to irrelevant information. Shanteau (1993) and Lesgold et al. (1988) suggested that the main distinguishing feature was the ability of the expert to recognise irrelevant information prior to making the decision. However, Neale and Northcraft (1986) discovered that experts were susceptible to framing bias.

Research concerning expert and novice problem-solving strategies indicated that the order of presentation of information to auditors had an impact on the development of the "mental model" of the situation and on the decision process (Lindsay, 1986; Frederick, 1991). Mental models are memory structures, compiled over time from experience and training, which assist in problem solving and related to mental accounting. Chi, Glaser and Farr (1988) identified key characteristics of the performance of experts in terms of how expertise is acquired and the conditions that enhance, as well as limit, the development of high levels of cognitive skills. Table 3.2 summarises the various domains in which expertise has been studied.

Table 3.2
Summary of Research on Domains of Expertise

Ability demonstrated	*Authors*	*Concept*
To excel in their own domain.	Johnson, Duran, Hassebrock, Moller, Prietula, Feltovich & Swanson (1981)	Demonstrated the recognition of diseases in medical diagnosis by physicians.
To perceive large meaningful patterns in their domain.	McKeithen, Reitman, Rueter & Hirtle (1981)	Showed programmer's ability to recall key programming language and subroutines.
To solve problems or perform faster than novices in their domain.	Chase (1983)	Found that experienced cab drivers could recognise a shorter route to a destination.
That experts have superior short-term and long-term memory.	Chase and Ericsson (1982)	Found that trained memory experts could recall more than 80 digits in a short-term memory task and 80-90% of digit groups from a week earlier.
That experts perceive a problem in their domain differently from novices.	Chi, Feltovich and Glasser (1981)	Found that experts in physics used principles of mechanics to categorise a problem whereas novices used literal objects to categorise the same problem.
That experts perform a qualitative analysis to gain a better understanding.	Paige and Simon (1966)	Examined different approaches to solving an algebra word problem.
That experts are more aware than novices of when they have made an error.	Larkin (1983)	Found that experts in physics would often check their answer and abandon certain solution attempts.

The literature suggests that experienced decision makers have highly developed knowledge structures and use directed strategies to focus only on relevant information. By contrast, novices process information piecemeal and their judgements are influenced by irrelevant information even if the difference is presented in an easily discernible format. An underlying assumption of this approach is that the decision maker is expected to understand or comprehend all important factors related to the decision. This concept is referred to as "intellectual capacity" (Lindblom, 1959). Intellectual capacity enables decision makers to evaluate all possible choices and their impact on the decision outcome (Provan, 1989). However, it is not always possible for decision makers to be aware of, or comprehend, all the factors related to a decision problem. The unpredictability and complexity of the consequences of a decision suggests that there are limits to the intellectual capacity of decision makers.

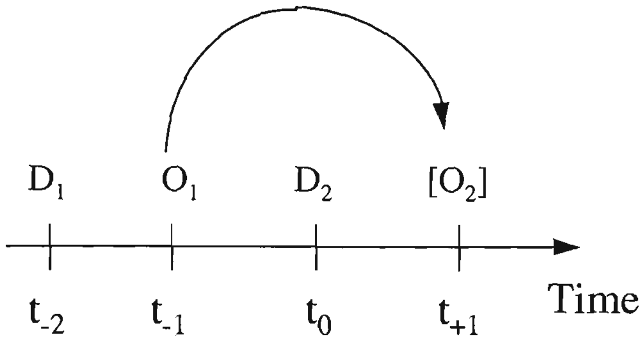
Time Preference

The concept of time is supposed to be irrelevant to rational decision making. However, time does play a crucial role in choice situations (Elster, 1986). The consequences of almost any given action can be spread over time. For example, one alternative might yield immediate gains while another might yield larger gains, but the benefits are delayed. When choosing between alternatives whose consequences have different temporal patterns, an individual must have a rationally justified way of comparing or weighing benefits that accrue at different points in time. Strotz (1955) showed that time preference leads to inconsistency, such as choice reversal, particularly if it has a non-exponential form. Non-exponential time preference implies that some of the future gains lose their value more rapidly than others (Elster, 1986). Conversely, time preference is exponential when the present value of the future decays at a constant rate as time progresses.

The point is that learning does take place and the memory from past decisions influences present decision making. For example, Payne, Bettman and Johnson (1993) stressed that decision strategies are learnt and provide the basic information-processing skills applied in decision making. More importantly the outcomes of past decisions are likely to influence the application of a decision strategy. Garling et al. (1997) proposed that memory of past outcomes was a prerequisite for influences on decisions in the present. They referred to this effect as a form of 'integration across time'. A time-line is useful for understanding the possible influences of past experience on decision behaviour. Figure 3.1 provides a graphical representation of the integration of decision outcomes across time.

Figure 3.1 illustrates that where an outcome (O_1) of a prior decision (D_1) is remembered, it may influence the evaluation and choice from the set of alternative outcomes ($[O_2]$) of the decision (D_2) being considered at the present time (t_0). This explanation is closely related to phenomena such as "prior outcomes" (Thaler & Johnson, 1990); "sunk cost effects" (Arkes & Blumer, 1985); "multi-stage betting" (Funk, Rapoport & Jones, 1979); and "escalation" (Brockner, 1992). This also suggests that effects of prior outcomes involving risky choices may be a contributing factor. Therefore, these factors should be included in research aimed at better understanding the decision-making process.

Figure 3.1
Integration of Outcomes Across Time



Source: (Adapted from Garling et al., 1997)

Valence

Valence is a measure of an individual's evaluation of reward desirability (Gray & Wert-Gray, 1999). Thus, valence represents the decision maker's preference of a particular outcome. Kessler, Ford and Bailey (1996) defined valence as:

> *...a decision object's relation to particular goals, which could be seen as either desirable or undesirable depending on the personal or situational concerns of a decision maker. For example... for managers, gaining negative publicity is undesirable because it can decrease a firm's value, whereas the loss of it could increase its value.*

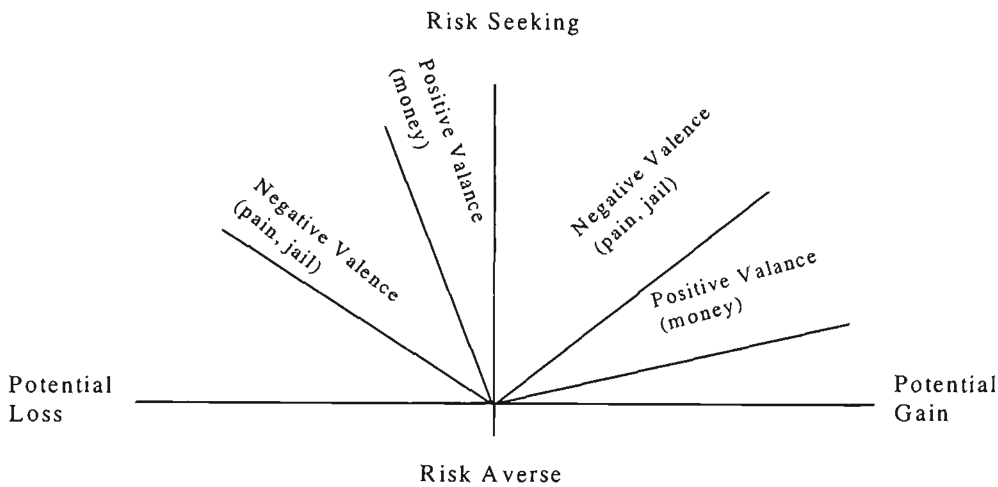
Valence is a term used in psychology to denote the different emotional experience derived from pleasure as distinct from pain (Elster, 1998, 51).

The point is that losses are not always associated with a negative outcome just as gains are not always associated with a positive outcome. Therefore, when considering the predicted influence of the framing effect, one must also be aware of the desirability of the decision object— that is the valence. An individual's risk preference is not determined simply by the frame of reference; valence acts to moderate the framing behaviour of individuals. This suggests that valence is yet another dimension to risk preference.

Kessler, Ford and Bailey (1996) found that valence significantly moderated the relationship between the frame of reference and risk preference. Individuals were found to be risk-averse when faced with value-increasing contingencies and risk-seeking when faced with value-decreasing contingencies. They proposed that risk preference was not determined by the frame alone and concluded that valence significantly moderated the relationship between the frame of reference and risk preference. Figure 3.2 presents a

graphical presentation of the concept of risk preferences as a function of both frame and valance.

Figure 3.2
Risk Preference as a Function of Frame and Valence



Source: (Adapted from Kessler, Ford & Bailey, 1996)

In effect, undesirable objects potentially create a paradox because the framing effect predicts risk preferences that are inconsistent with the certainty effect. In light of the information presented in the figure, Kessler, Ford and Bailey (1996, 245) made the observation that:

> *... individuals' risk preferences are a function of the frame of reference moderated by the valence of the decision object (i.e. value), where value-decreasing scenarios result in more risk-seeking preferences and value-increasing scenarios result in more risk-averse preferences.*

In exploring another anomaly of valence, Hasen (1990) concluded that individuals were at best described as quasi-rational in that they strive toward rational ends but are influenced by cognitive constraints regarding their decision making under risk or uncertainty. The reference to cognitive constraints is also a link back to the role of mental models as raised with regard to the process of mental accounting.

Endowment Effect ~ Loss Aversion

Behaviour in which an individual demands more compensation to give up an object than they would be willing to pay for it is generally referred to by the term "endowment

effect" (Thaler, 1980). The endowment effect is considered a manifestation of loss aversion (van Dijk & van Knippenberg, 1996). Loss aversion refers to the concept that losses loom larger than gains in the individual's mind (Kahneman & Tversky, 1979). This phenomenon suggests that once a person possesses a good, it is immediately considered more valuable than before they possessed the item; therefore, they are reluctant to exchange the item for something else (Kahneman, Knetsch & Thaler, 1990).

This reluctance to trade was demonstrated in several experiments. In the first example, subjects endowed with coffee mugs were reluctant to trade with subjects endowed with Swiss chocolate bars, and vice versa (Knetsch, 1989). In a similar study, subjects endowed with coffee mugs were reluctant to trade with subjects endowed with pens, and vice versa (Kahneman, Knetsch, & Thaler, 1990). The differences in perceived cost were demonstrated empirically by Thaler (1980) and are described in the example below.

> *Mugs worth approximately $5 were randomly given to one group of students. Minimal selling prices were elicited from those given the mugs (with an incentive compatible procedure that ensured honest reports). Minimal prices, sums of money such that they would* choose *that sum rather than the mug, were elicited from another group of subjects not given mugs. These two groups, sellers and choosers, faced precisely the same choice between money and mugs, but their reference points differed. Those who were randomly given mugs treated the mugs as part of their reference levels or endowments, and considered leaving without a mug to be a loss, whereas individuals not given mugs considered leaving without a mug as remaining at their reference point. In one experiment the median value placed on the mug was $3.50 by choosers but $7.00 by sellers.*

The present body of research of the endowment effect provides strong evidence that the endowment effect is robust across individuals and situations (Thaler, 1999; Haan, 1997; Mackenzie, 1997).

Summary of Behavioural Concepts

The behavioural concepts involved in decision making may roughly be described as mental models constructed by individuals to provide a general understanding of events. Framing effects serve to place events in a context that provides meaning within an individual's prior experience and the frame may be either positive or negative. An

individual assesses the desirability of an event outcome or goal through these mental processes. Other behavioural concepts demonstrated to affect decision behaviour were past experience, valence (desirability of the outcome) and the endowment effect. Thus, behaviour may be viewed as a consequence of framing, experience, mental accounting, valance and the endowment effect. These behavioural concepts provide an insight into why individuals are likely to make decisions that contradict not only the normative model of rational decision making but also the explanations of other behavioural theories examined in this chapter which seek to address the sunk cost effect.

Motivational Theories of Decision Making

Motivational theories and research concerning motivation are directed to identifying factors that underlie behavioural actions such as decision making. Motivation is defined as a cognitive state that generates behaviour and biases attention towards particular goals (Kolasa, 1969, 249). Motivation is also considered as the driving force within individuals that impels them to take a particular action (Schiffman & Kanuk, 1997). There are various motivational theories concerning decision making which distinguish between "rational motives" and "emotional motives". Motives cannot be easily inferred from behaviour and empirical research requires a theoretical framework from which to infer the appropriate motives for observed behaviour.

There are four key motivational theories that deal with decision-making behaviour: expectancy theory, regret theory, hindsight bias, and self-justification theory.

Expectancy Theory

Expectancy theory is based on the notion that individuals acting in self-interest adopt courses of action to maximize the probability of desirable outcomes for themselves (Vroom, 1964; Isaac, Zerbe & Pitt, 2001). Decision makers assess the probability of, and the value of, the goal outcomes for alternative courses of action and select the one with the greatest subjective expected utility. Decision makers are presumed to focus on future outcomes and the probability of achieving them, even after suffering setbacks to the valence outcome with regard to rewards. Research using subjective probability as a predictor (Arvey, 1972; Motowidlo, Loehr & Dunnette, 1978) provided only modest

support for expectancy theory (Matsui, Okada and Mizuguchi, 1981). Mento, Cartledge and Locke (1980) found that expectancy theories of motivation were less predictive of performance than goal-setting theories. Staw and Ross (1978) found that expectancy theory did not provide the capacity to predict the occurrence of entrapment or escalation to commitment. Therefore, Klein (1989) suggested that expectancy theory did not adequately describe or explain most motivational situations.
attribute in an effort to satisfy their aspirations.

In a meta-analysis of 64 expectancy studies, Ouelette and Wood (1998) found that the frequency of past behaviour added significantly to the prediction of both intentions and future behaviour, indicating experience is a variable. In a meta-analysis of 87 studies, Shepherd, Hartwick and Warshaw (1988) found that 46% of the variance in intention was explained by the theory. A strong link between the intention to carry out a particular act or make a particular choice and the subsequent behaviour has been found in most research using the theory of reasoned action.

Regret Theory

The idea that emotions play a part in decision making is not unusual. Regret theory provides a framework for examining this phenomenon. Janis and Mann (1977) examined the role played by emotions in decision making and maintained that the fear of future regret influences behaviour, thereby inducing people to make more rational choices. They proposed that an individual computes the maximum of possible regret for each option and then chooses the option with the smallest maximum regret. Acker (1997) proposed a modification of regret theory by including the concept of "tempered regrets", in which zero regrets are replaced by a score representing the rejoicing felt when the outcome obtained is better than the foregone outcome.

The assumption is that people experience emotions as a consequence of comparing the actual outcome with the foregone outcome, had they made a different choice. These feelings cause people to experience regret when the foregone outcome might have been better. Conversely, people rejoice when the foregone outcome might have been worse. Further, the emotional consequences of decisions are anticipated and therefore taken into account when making decisions. This implies that an important determinant of

decision making is a tendency on the part of an individual to avoid negative post-decisional feelings such as regret, disappointment and self-recrimination in favour of positive feelings such as rejoicing, elation and pride (Loomes & Sugden, 1982).

The corollary of this assumption is that anticipated regret leads to risk-aversion (Josephs et al., 1992; Richard, van der Pligt & de Vires, 1996). In a review of regret theory, Kardes (1994, 448) made the statement that *"Concern about regret that may follow a bad decision promotes extreme risk-aversion."* Regret theory postulates that utility depends upon feelings evoked by the outcomes of the rejected options (Loomes & Sugden, 1982), in addition to the possible pain and pleasure assigned to the outcomes of particular options. Research provided evidence that individuals may be more appropriately thought of as "regret-averse" rather than "risk-averse" (Larrick & Boles, 1995; Zeelenberg & van Dijk, 1997).

In order to assess regret as a motivating factor, the following scenario adapted from Heyne (1997) provides an example of regret relating to a sunk cost.

> *Consider the plight of David and Jane who pay $250,000 to acquire a block of land and build a home overlooking the beautiful Lake Illaway. They expect to derive more than $250,000 worth of benefits from living in their magnificent new home with its breathtaking view. However, soon after taking up residence they notice that in addition to the view Lake Illaway provides an odour. The smell gets progressively worse. Finally, David and Jane can't stand the odour any longer and decide to sell. However, the best offer they receive is a mere $60,000. What should they do?*

David and Jane *should* compare marginal benefits and marginal costs by weighing the benefits of a reduction in odour against the cost of continuing to live in the house, which is $60,000 foregone. In other words, would they choose to buy the house knowing what they know now, if the total price were $60,000? If not, then they should sell. What of the remaining $190,000 they invested? That is the loss they have incurred by paying $250,000 for something that has turned out to be worth only $60,000. They can't avoid the loss by staying in the house. David and Jane may regret their initial decision to buy the land and then build the house. This may lead them to think more carefully before making any further decisions, thus becoming risk-averse.

The sunk cost effect is predicated upon the influence of past costs, such as the loss referred to in the example and the unwillingness of individuals to let go of those past costs (Teger, 1980; Arkes & Blumer, 1985; Northcraft & Neale, 1986; Garland, 1990). Regret may be responsible for the intensity of the feeling that an individual has toward sunk costs. Regret for having incurred a sunk cost leads to irrational behaviour. The construct of regret has received minimal attention in prior research, possibly due to the difficulty in its measurement and the close relationship to the concept of subjective utility.

Hindsight Bias

The hindsight bias (Fischhoff, 1975) or the "knew-it-all-along effect" (Wood, 1978) is also known as the "outcome bias" (Baron & Hershey, 1988). Hindsight addresses the tendency of people to alter their perception of the inevitability of an event after the outcome of that event is known. Research revealed that decision makers find difficulty ignoring intervening events or outcomes (Fischhoff, 1975; Wood, 1978; Arkes et al., 1981; Hawkins & Hastie, 1990). Demakis (1997, 190) defined hindsight bias as *"a tendency to exaggerate one's ability to have foreseen the outcome of an event, after learning the outcome."* For example, Brown and Solomon (1987) found that the decision of a capital budgeting committee was evaluated differently after a project's success or failure was reported than before the outcome data were available. In a study of students and members of the Institute of Management Accountants (US), Lipe (1993) found that managers making variance investigation decisions were evaluated more favourably when investigations revealed problems in the system. Accordingly, hindsight bias does not offer an appropriate avenue for investigating escalation to commitment or sunk cost effects. This is because hindsight bias occurs after the event and the sunk cost phenomenon occurs during decision making.

Self-Justification Theory

Self-justification theory— attributed to Aronson (1976)— was inspired by cognitive dissonance theory (Festinger, 1957) and proposed as a possible explanation for escalation to commitment (Staw, 1976). Self-justification theory posits that individuals are driven by the need to maintain the appearance of rational behaviour. The implication is that people do not want to admit that their past decisions were incorrect and therefore

they maintain their commitment to the chosen course of action to reaffirm the correctness of the original decision. Staw and Ross (1978) applied self-justification theory to circumstances in which individuals *"may also increase their commitment of resources to a course of action in order to protect themselves from suffering the psychological costs of failure."* This suggests that when negative feedback regarding the outcome of the initial resource allocation and the high need to justify the correctness of the initial allocation of resources jointly occur, the likelihood of escalation of commitment should be greatest (Brockner, 1992).

The contribution of self-justification theory is most apparent in the retrospective analysis of circumstances involving entrapment or escalation to commitment (Rubin & Brockner, 1975; Staw, 1976; Teger, 1980). The theory has also been applied to explain circumstances involving cognitive rationalisation or behavioural inaction (Staw & Ross, 1978). In a similar approach, Bazerman (1984) reassessed earlier research on decision making by focusing on escalation to commitment and group decisions concerning what is referred to as "risky shift". Bazerman proposed that the escalation to commitment observed in prior research was due to experimental cases being framed differently between the groups. In regard to the research concerning risky shift, he suggested that the decision was framed as a potential gain. As a result, he argued a framing effect was evident and that results of prior research that did not note these framing effects were not conclusive.

A major problem with research based on self-justification theory is that the findings may be open to alternative interpretations. Bowen (1987) argued that prior escalation studies did not demonstrate the phenomenon. Competing theories later emerged which challenged self-justification theory and offered alternative explanations at the individual level (expectancy theory and prospect theory) and the interpersonal and group levels (group polarisation, modelling processes and self-presentation theory).

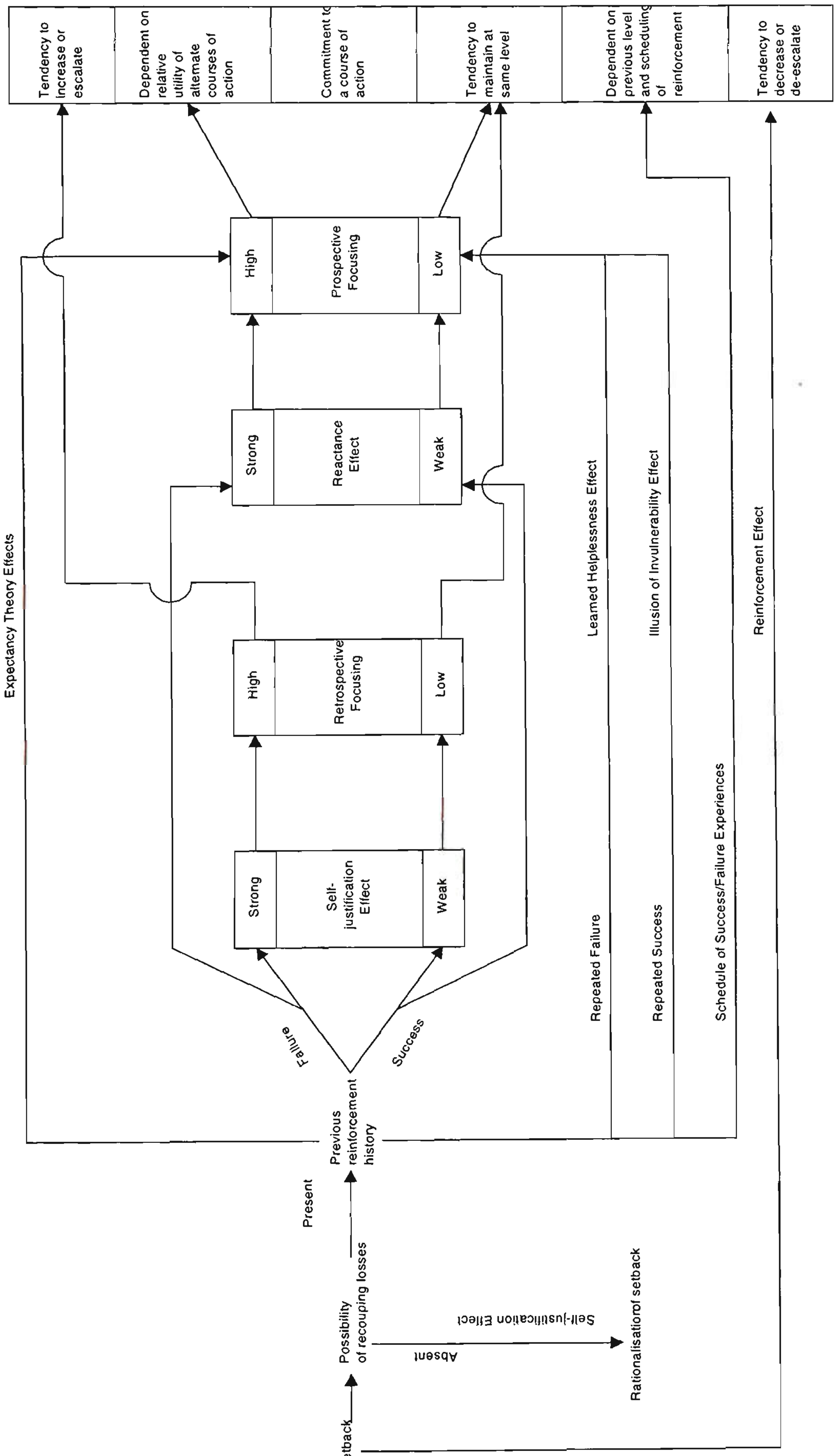
Summary of Motivational Constructs

Motivational theories provide an insight into the way an individual's behaviour may be influenced. For that reason alone, motivation as a driving factor is important to the examination of decision behaviour. The various motivating factors may be drawn

together to provide a general overall perspective for examining behaviour. However, certain motivational theories are less relevant to the observation of the sunk cost phenomenon. In an attempt to identify the potential of a multi-theoretical application of motivation theories, Staw and Ross (1978) constructed a model (depicted in Figure 3.3). The model is based on the relationship between motivational factors and commitment to prior decisions.

The model provides an insightful analysis of the relationship between motivational factors for financial decision-making research. However, the model has not been applied to the sunk cost effect, most likely because of the number of constructs and the degree of monitoring and testing required to justify the model. Nevertheless, the model provides a solid basis for understanding the complexity of motivational factors that influence human behaviour.

Figure 3.3
A Multi-theoretical Model of Commitment to a Course of Action



Source: (Staw & Ross, 1978)

Social Learning Theories

Social learning theories are concerned with behaviour patterns that individuals develop in response to environmental contingencies (Atkinson et al., 1987, 370). The cognitive processes described in these theories are based on the assumption that because individuals can represent situations symbolically, they are able to foresee the probable consequences of their actions. Therefore, they are likely to alter their behaviour accordingly. The emphasis in these theories is on the role of cognitive processes and learning. Social learning theory suggests that learning takes place vicariously and through imitation (Bandura 1965; 1976). Vicarious learning is learning by observation where behaviour patterns are learned by watching the behaviour of others and observing the consequences that result (Atkinson et al., 1987, 370).

To the extent that learned behaviour influences an individual's decision-making behaviour, three social learning theories are examined in this section: reinforcement, learned helplessness, and illusion of vulnerability. The discussion focuses on explanatory powers for decision-making behaviour where sunk costs are involved.

Reinforcement Theory

Reinforcement theory addresses the consequences that are likely to influence behaviour (Skinner, 1969). The theory suggests that 1) negative consequences or outcomes lead decision makers to commit fewer resources to a prior course of action, perhaps in favour of a new project and 2) that commitment to a course of action is a function of one's experience from previous reinforcement (Gross, 1991). There are three basic principles derived from this theory. First, consequences that give rewards increase a particular behaviour. Second, consequences that give punishments decrease a particular behaviour. Third, consequences that give neither rewards nor punishments extinguish a particular behaviour.

The model predicts that systems of emotion can be used to explain the responses of an individual in any situation (Wilson, Barrette & Gray, 1989; MacAndrew & Steel, 1991; Corr, 2001). However, this theory originated from research involving animals and has received only minor attention in studies seeking to apply the concepts to human behaviour (Corr, 2001). Singer and Singer (1986) found that individuals who were

responsible for negative outcomes tended to either reduce or maintain their commitment to a previously chosen course of action. However, as with expectancy theory, the explanatory power of reinforcement theory lacks consistency.

Learned Helplessness Theory

Another social learning theory is "learned helplessness", generally applied to the phenomenon of helplessness in humans (LaForge, 1989). An individual suffering from learned helplessness is likely to repeat the same behaviour, even though the behaviour may be inappropriate for the type of decision being made (Gross, 1991). The theory has been applied to a variety of situations: advertising and sales promotion (Hart, 1983), marketing (Hart & Moncrief, 1985) and performance deficits (Martinko & Gardner, 1982). The theory proposes that individuals who experience repeated failure from their decision making may consider that no relationship exists between their actions and the consequences. Therefore, the individual tends to ignore relevant information in subsequent decision making. However, there is a lack of prior research concerning the applicability of the theory to the sunk cost effect and escalation to commitment.

Illusion of Invulnerability

The third social learning theory deals with the "illusion of vulnerability" found in decision making. The illusion of invulnerability theory posits that if a decision maker has experienced an extended series of successes, a set-back will not necessarily cause the individual to take a realistic view of the circumstances (Janis & Mann, 1977). This theory predicts that the same negative behaviour as espoused under the learned helplessness theory will occur. While the underlying cause of the behaviour is the opposite to the driver underlying learned helplessness both theories refer to learned behaviour affecting decision making. The illusion of invulnerability is used to describe one of the symptoms responsible for "group think" (Janis, 1989). In the group think model, the illusion of invulnerability is applied to explain how experts in a group feel that nothing can go wrong after making a decision because *"everything is going to work out all right because we are a special group and nothing can go wrong"* (Janis, 1989). However, as with the learned helplessness theory, there is a lack of prior research concerning the applicability of the illusion of invulnerability to the sunk cost phenomenon or escalation to commitment.

Summary of Social Learning Theories

Social learning theories offer insights into human behaviour that assist in explaining irrational decision behaviour that has been observed, such as the sunk cost effect. The assumption underlying these theories is simply that individuals learn from experience. What an individual learns from experience is likely to influence a person's perception of a decision task and the subsequent choice. The effects of experience may be manifest in terms of reinforcement, learned helplessness, or the illusion of invulnerability. Thus, experience can have a positive or a negative influence on the cognitive processes of an individual and influence the outcome of the decision process.

Cognitive Theories of Decision Making

Cognitive theories employ information-processing models to explain how people make decisions. The way a person organises information is referred to as their cognitive style (Cronbach, 1960). In particular, the research is concerned with how people process information and then act on that information (Mason & Mitroff, 1973; Vasarhelyi, 1977). There are three key cognitive approaches heuristic/analytic reasoning, image theory and prospect theory.

Heuristic/Analytic Reasoning

Heuristic reasoning involves the search for analogies that share characteristics with familiar solved problems. Analytical reasoning involves reducing the problem to a core set of causal relationships to determine some optimal outcome. Huysman (1968, 51) employed a heuristic/analytic framework to test for different cognitive decision styles and found heuristic reasoning a difficult approach to define beyond characterising the resulting decisions as being consistent with the prevailing internal and external environment. Heuristic models have a wide range of application and relevance to the types of decisions faced in economic and financial activities in which sunk costs are prevalent.

Image Theory

Beach (1990) proposed that decision makers apply their stored knowledge (referred to as images) to set standards to guide decisions concerning what to do (goals/outcomes) and how to go about achieving the outcomes (plans). The stored knowledge is further partitioned into three categories representing the decision maker's vision of the course of events (Beach, 1993, 165). The three categories are value image, trajectory image and strategic image. Value image considers the principles of the decision maker in terms of values, morals and ethics and is the basis for establishing goals worthy of pursuit. Trajectory image relates to the agenda that underlies the goals. Strategic image implies tactics and forecasts which relate to the goals (Beach, 1990; Beach & Mitchell, 1990; Mitchell & Beach, 1990). The prediction is that a decision made by an individual is a function of the perceptions of the three images (Mitchell, Rediker & Beach, 1986; Dunegan, Duchon & Ashmos, 1995).

These images are relevant to making decisions concerning adoption and progress choices. Adoption decisions are concerned with new projects, plans or activities. Progress decisions are related to deliberations concerning projects, plans or activities already commenced. Dunegan, Duchon and Ashmos (1995, 32) indicated that in both adoption and progress decisions, image compatibility acts as a catalyst for differentiated actions. When information is perceived as positive, the trajectory and strategic images are compatible and no change in course of action is deemed to be warranted by a decision maker. Conversely, when information is perceived as negative, images appear more incompatible and the decision maker is more likely to take action intended to rectify the situation (Beach et al., 1992).

Dunegan, Duchon and Ashmos (1995) found that image compatibility acted as a moderating variable, influencing the degree to which information was used by a decision maker in choosing a course of action. They also found that the use of a problem space image to guide resource allocation decisions varied with perceptions of image compatibility. Typically, when image compatibility was high, information use declined; when compatibility was low, information use increased. Image theory, however, does not address the concept of imagination nor the processes by which images are created and sustained. Unlike the proposed framework of Teigen and Brun

(1995), image theory does not make the link between causal considerations and perceived realism in the framing of the scenario.

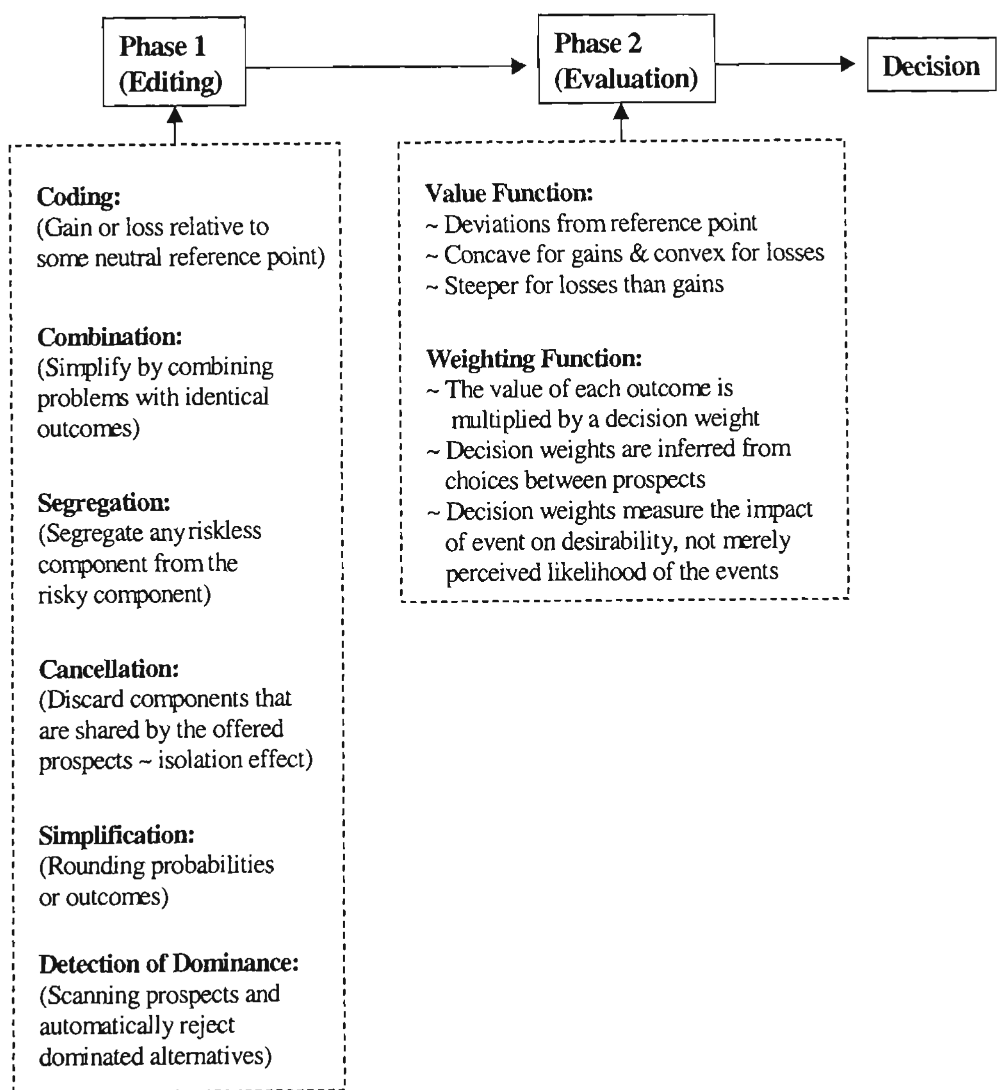
Prospect Theory

Kahneman and Tversky (1979) introduced prospect theory in response to the shortcomings of research into decision making based on expected utility theory. Under expected utility theory, a risky prospect is considered to be equal to the expected utility of its outcomes, obtained by weighting the utility of each possible outcome by its probability (Kahneman & Tversky, 1979, 264; Sinn, 1985, 185). Accordingly, a rational decision maker prefers the prospect that offers the highest expected utility (von Neumann & Morgenstern, 1947; Savage, 1954; Raiffa, 1961; Fishburn, 1984). Prospect theory predicts that people prefer the sure option when choosing between two alternative courses of action framed in terms of gains and prefer the risky option when choosing between two alternatives framed as losses (van Schie & van der Plight, 1995). The theory has been used to explain observed behaviour in fields such as economics (Benartzi & Thaler, 1995; Odean, 1998), medicine (McNeil, Pauker & Tversky, 1988), consumer behaviour (Thaler, 1985), social psychology and political science (Kramer, 1989; Quattrone & Tversky, 1988).

There are two aspects that set prospect theory apart from expected utility theory (Tversky & Kahneman, 1981). First, in prospect theory, outcomes are expressed as positive or negative deviations (gains or losses) from a neutral reference point, which is assigned a value of zero. Second, in prospect theory, the value of an uncertain outcome is multiplied by a decision weight— a monotonic function. Prospect theory acknowledges that the process of making choices consists of two phases: an initial editing phase followed by an evaluation phase (Kahneman & Tversky, 1979, 274). The function of the editing phase is to allow for the information to be organised and reformulated, thereby simplifying the subsequent evaluation and choice. The evaluation phase is based upon the assumption that values are attached to changes rather than final states and that decision weights do not coincide with stated probabilities (Kahneman & Tversky, 1979, 277).

Prospect theory predicts that when outcomes are framed in a positive manner (gains), there is an observable propensity for decision makers to be risk-averse, and conversely when the frame is negative (losses), decision makers are more likely to be risk-seeking (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981; 1986; 1991; 1992). In other words, decision makers will prefer a sure gain over a gamble of equal expected value, yet will reject a sure loss in favour of a gamble of equal expected value (Paese, 1995). The framework of prospect theory is reliant on the integration of these various constructs underlying the two basic phases as depicted in Figure 3.4.

Figure 3.4
Overview of Prospect Theory Constructs



Source: (Adapted from Kahneman & Tversky, 1979)

Tversky and Kahneman (1981) showed that the concept of a gain or a loss is highly subjective and that two different descriptions of the same outcomes can elicit different choices.

Prospect theory is similar to expected utility theory in that a decision maker is assumed to first assign a utility or value $v(o)$ to each outcome o, before choosing the option with the highest sum of values across all outcomes. However, under prospect theory there is an assumption that a decision maker edits options prior to assigning values to outcomes. This editing takes the form of framing of outcomes as gains or losses relative to a reference point. The evaluation phase employs a value function $v(\bullet)$ and a probability weighting function $\pi(\bullet)$. For example, consider a choice between three outcomes: a with probability p, b with probability q, and the status quo with probability $1 - p - q$. The prospect theory value of the choice is represented by:

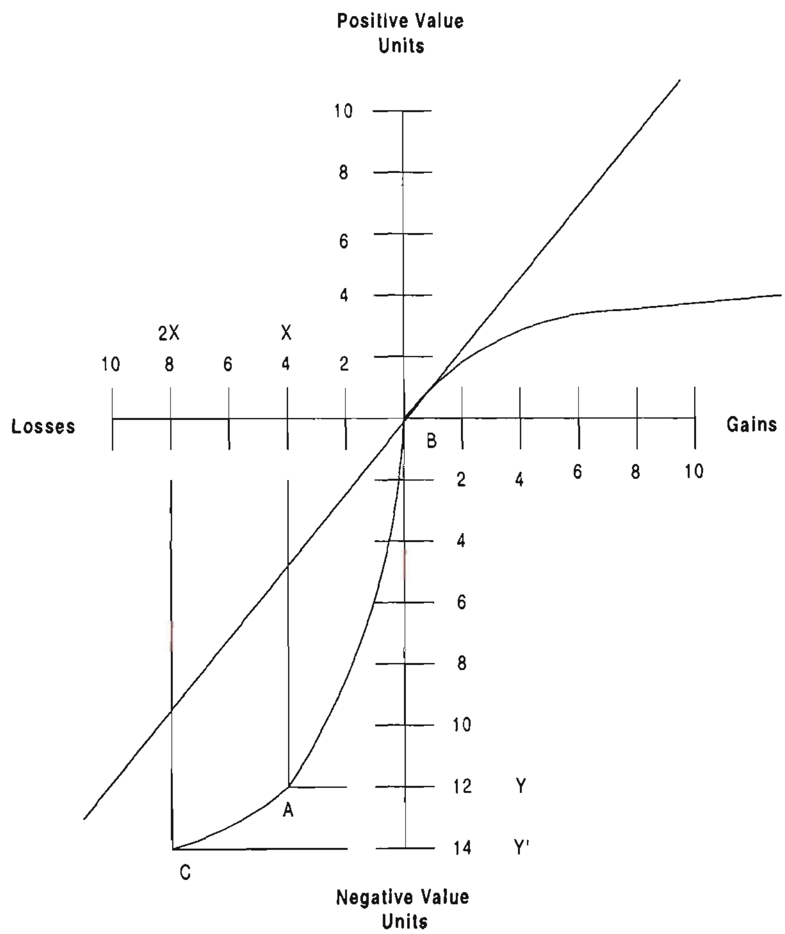
$$\pi(p)v(a) + \pi(q)v(b)$$

The argument of the value function is that the choice payoff is the change in, but not the level of, wealth. In prospect theory, the conveyor of utility is gains and losses measured against some implicit reference point. The value function is assumed to be concave in gains and convex in losses, a pattern consistent with the experimental evidence on domain-sensitive risk preferences. The curvature of the value function is also consistent with the psychometric theory that states that as deviations from a reference point increase, deviations occur with diminishing marginal sensitivity (Laibson & Zeckhauser, 1998). The value function proposed by prospect theory is close to an "S" shape. Figure 3.6 depicts this value function on the axis of positive/ negative values and amount of losses/gains. The consistency of this "S" curve is contested. Salminen (1994) suggested that the "S" shaped value functions of prospect theory were valid only for convex preferences.

Garland, Sandefur and Rogers (1990, 721) provided an explanation of the value function calculation of a decision maker as depicted in Figure 3.5:

> *The first alternative is riskless, whereas the second offers either a potential gain in utility of Y units (should the entire investment be recovered and the individual winds up at point B) or an additional loss of Y' – Y units (should the individual fail to receive any return and wind up at point C). The convex shape of the value function under loss assures that Y' – Y will always be less than Y. Given an even chance of additional loss or complete recovery of the entire investment, the individual ought to prefer additional investment to withdrawal.*

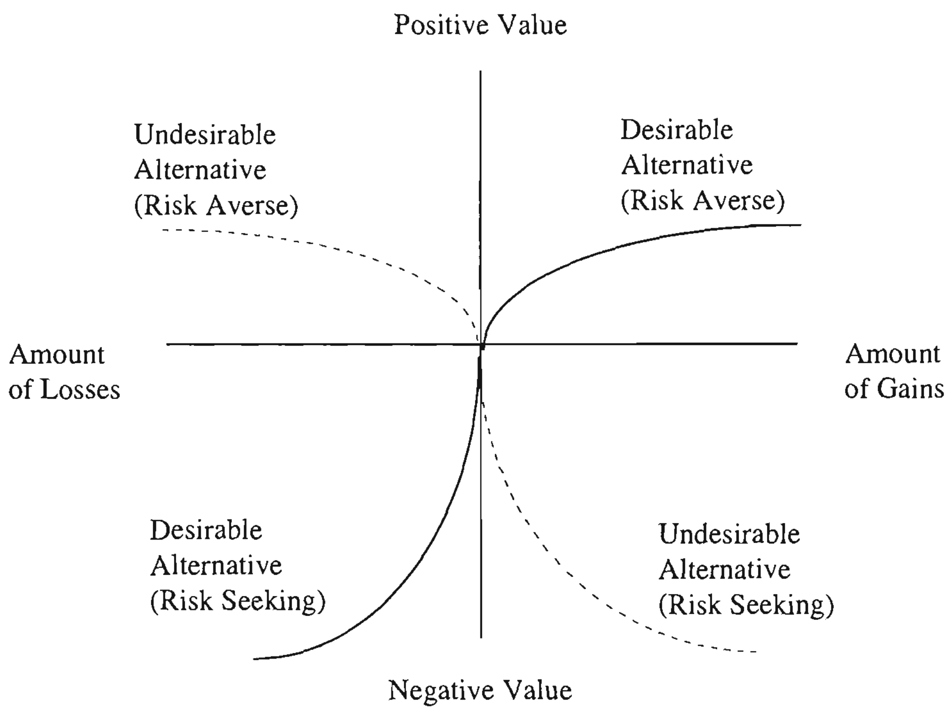
Figure 3.5
Prospect Theory Value Function with Incurred Sunk Costs and Alternatives of Reinvestment and Withdrawal



Source: (Adapted from Kahneman & Tversky, 1979; Garland, Sandefur & Rogers, 1990)

Under prospect theory, outcomes are expressed as positive or negative deviations (gains or losses) from the reference point. However, Kessler, Ford and Bailey (1996, 245) argued that *"...a model in which gains are the only means to positive value and losses are the only means to negative value is inconsistent with a subjective, contextually grounded conception of decision making."* They reasoned that the framing effect should not be limited to desirable decision objects or outcomes and that incorporating valence as a third dimension of the risk preference evaluation framework would address the issue. Figure 3.6 incorporates the additional value function related to the notion of desirable and undesirable outcomes (also referred to as object valence) associated with the choice.

Figure 3.6
Prospect Theory Value Function Extended to Include Object Valence

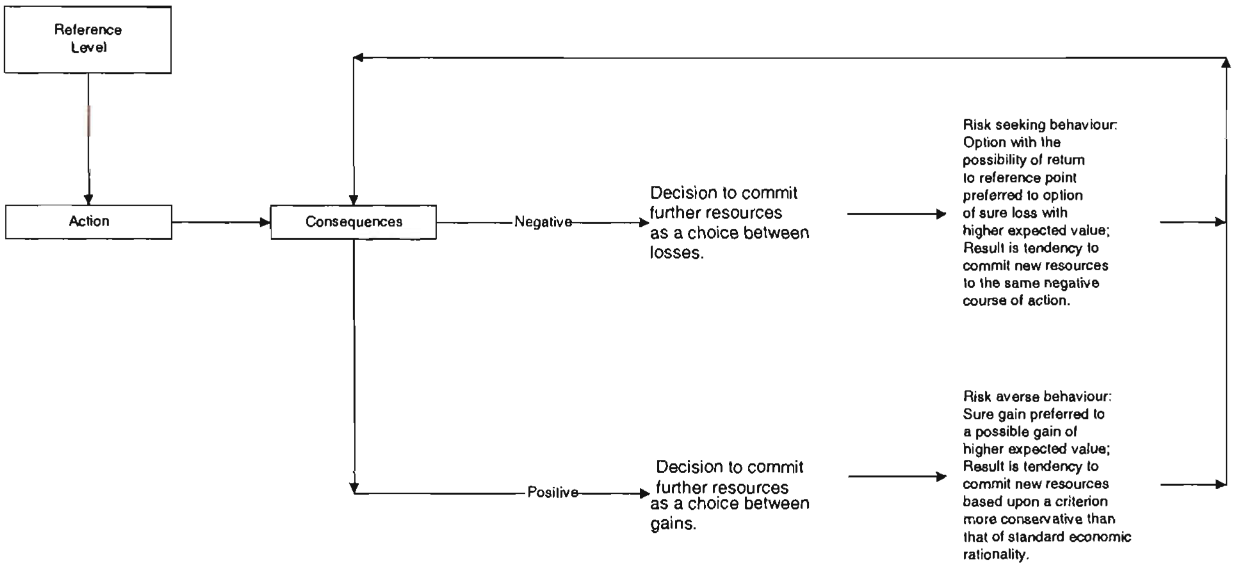


Source: (Adapted from Kessler, Ford & Bailey, 1996)

According to Kessler, Ford and Bailey (1996) risk preference is a function of the frame effect moderated by valance. Thus, the criticism that prospect theory has focused on one dimension - perceived desirability – is addressed by the inclusion of valance associated with the options being considered. This provides for an alternative explanation of risk behaviour that was otherwise not consistent with the risk preference predicted by prospect theory.

Whyte (1986, 316) compared prospect theory with the theory of self-justification and argued that a distinct difference existed with regard to the role of sunk costs within the two theories. Prospect theory relegated sunk costs to a component of the reference point. The self-justification model included sunk costs in the computation that determined whether the benefits of a particular course of action exceeded the costs or not. As a result of this difference, Whyte (1986, 317) proposed a model based on prospect theory as an alternative to Staw's self-justification theory model. Whyte's model is replicated in Figure 3.7.

Figure 3.7
Commitment of New Resources to a Failing (or Successful) Course of Action



Source: (Whyte, 1986, 317)

The risk preferences of prospect theory depend on whether outcomes are framed as gains or losses. To capture loss aversion, the value function is assumed to kink at the reference point, with a slope ratio of two to one between losses and gains respectively. The value function was depicted in Figure 3.5 on page 75.

There are two important implications of the probability weighting function, a major component of prospect theory. First, when small probabilities are over-weighted, decision makers will make risk-seeking choices when there is low probability and high-reward choice. Second, when high probabilities are under-weighted, complete insurance is very attractive to the decision maker. Kahneman and Tversky's (1979, 1982) experimental results suggest that the probability weighting function also exhibits diminishing marginal sensitivity.

Risk & Uncertainty in Prospect Theory

The focus on negative or positive outcomes may be linked to the phrasing of the risk evaluation. Table 3.3 provides an illustration of the predictive nature of prospect theory in terms of the implied occurrence or non-occurrence of an event.

Table 3.3
Influence of Phrasing in Appraising Uncertain Events

Type of Outcome	*Occurrence*	*Non-occurrence*
Positive (gains, successes, achievement of goals)	Opportunity Orientation	Uncertainty Orientation
Negative (losses, failures)	Risk Orientation	Safety Orientation

Source: (Adapted from Teigen & Brun, 1995)

Consistent with prospect theory, the outcome from an event can be either positive or negative. The phrasing has close alignment with an image of attainment or success in the case of a positive outcome and the occurrence is perceived as having an opportunity or positive potential orientation. By contrast, doubts regarding the likelihood of the positive outcome (non-occurrence) suggest a lack of assurance or an uncertainty orientation. With a negative outcome, the phrasing has connotations of loss or failure. The occurrence is perceived as having a risk orientation while non-occurrence is more in keeping with a safety orientation. According to prospect theory, decision makers tend to be risk-averse in events framed as gains. This is explained in Table 3.3 as relating to the possible non-occurrence— the decision maker is concerned with missing out on the gain. The table matrix posits that different orientations are responsible for different behaviour of decision makers.

Reference Points in Prospect Theory

The concept of a reference point is derived from the psychology of perception which states that when evaluating alternatives, human perceptual mechanisms appear to consider differences rather than absolute levels (Festinger, 1957). A reference point acts as a target level when evaluating risky choices. The theory of rational decision making postulates that individuals have a preference function to rank specific characteristics of alternatives. Fisher (1930) noted *"our present behaviour can only be affected by the expected future...not the future as it will turn out but the future as it appears to us."* In order to be consistent in the measurement of alternatives, it is important to use the same reference point.

The measurement of costs and benefits is affected by changing reference points when applying preference ranking. When the specific characteristics measured are dollar

values, the change in reference point is especially important when determining profit or wealth. Gains or losses are determined relative to the psychologically neutral reference point that represents an individual's current or potential wealth. Outcomes under the prospect theory model are expressed as gains or losses from this neutral reference point (Kahneman & Tversky, 1979).

There is little evidence, other than reliance on economic and statistical research, to support the claim that manipulation of the reference point through framing leads conclusively to identification of risk attitude. The statistical evidence in various research articles supports the conclusion that the reference point influences a majority of decision makers. The profile of the individual's propensity for risk taking or risk aversion is not strictly explained, rather it is interpreted from group behaviour. However, the findings presented in the literature with regard to the influence from the reference point and framing effects are very convincing.

Research relied on the assumption that managers use average industry performance as the preferred reference point in assessing risk (Figenbaum, 1990; Figenbaum & Thomas, 1986; 1988; Jegers, 1991; Wiseman & Bromiley, 1991). Gooding, Goel and Wiseman (1996) challenged previous research that assumed a single fixed reference point when defining two decision contexts. Extending the argument to decision making in a broader context, this is consistent with circumstances where more than one alternative is being examined. A single fixed reference point may not be possible in such a situation and a decision maker may well employ more than one reference point.

Figenbaum, Hart and Schendel (1996, 223) were critical that no formal theory existed for the formulation of reference points. Organisational strategic decision making concerning the acquisition of assets is better explained by the notion of the reference points within prospect theory according to these researchers. Bernstein (1986) concluded that valuation of a risky opportunity depended far more on the reference point from which the possible gain or loss could occur, than on the final value of the assets. The implication was that the present wealth of an organisation acts as a reference point against which future benefit is measured. March (1988a) and March and Shapira (1987; 1992) proposed the concept of a variable reference point tied to expectations and assumptions of the firm rather than the individual decision maker.

Framing Effects in Prospect Theory

Studies provide evidence that the framing effect depends on task, content, and context variables inherent in choice problems which themselves may involve distinct psychological mechanisms (Fagley & Miller, 1987; Highouse & Paese, 1996; Levin et al., 1985; Petrinovich & O'Neil, 1996; Roszkowski & Snelbecker, 1990). Kuhberger (1998) conducted a meta-analysis of the influence of framing on risky decisions and found that a positive frame led to risk-aversion while a negative frame led to risk-seeking, as predicted by the prospect theory model. While providing evidence that the framing effect was a reliable phenomenon, the study highlighted the need to distinguish between outcome salience manipulations and reference point manipulations as well as drawing attention to the considerable effect that procedural features of the experimental settings had on the size of the framing effect.

Fagley and Miller (1997), Jou, Shanteau and Harris (1996) and Wang (1996b) found that individuals were more risk-seeking when dealing with human life problems than with money problems of the same probability structure. This phenomenon does not fit the predicted value function of prospect theory. Wang, Simons and Bredart (2001) suggested that in socially unfamiliar or naive situations, framing effects could be an indication of indecisive risk preference. There is evidence to suggest that the framing effect is not a complete explanation of the influences exerted on individuals. Li and Adams (1995) and Fagley and Miller (1997), using similar scenarios as reported by Kahneman and Tversky, failed to replicate the framing effect. Kessler, Ford and Bailey (1996) questioned the certainty effect posited to be responsible for the concave (risk-averse) shape of a decision maker's value function above the reference point and convex (risk-seeking) shape below the reference point. They proposed that risk preference was not determined by the framing effect alone.

Framing, Risk Propensity and Risk Perception

Upon reviewing prior research involving framing effects Pablo (1997) argued that framing manipulations were unintentionally confounded with historical influences on risk propensity; in particular providing small success or failure experiences that fostered particular tendencies toward risk taking. In support of these claims, Pablo (1997, 6) pointed to research that failed to find any framing effects (Cohen, Jaffray & Said, 1987; Fagley & Miller, 1987) and research that found risk behaviour opposite to that predicted

by prospect theory (Fishburn & Kochenberger, 1979; Hershey, Kunreuther & Schoemaker 1982; Fagley & Miller, 1990). These consistent findings suggest that a model of risk behaviour needs to examine variables beyond merely situational variables (Pablo, 1997).

A review of the literature on the effect of risk on decision behaviour was conducted by Sitkin and Pablo (1992). They concluded that prospect theory was not supported by all the research findings. The implication drawn was that the contradictory findings may be an artefact of the research methods used or that risk perceptions may be correlated with a unidentified variable. Sitkin and Pablo (1992, 26) proposed that the unidentified variable was likely to be risk propensity and then proceeded to develop a model to support their assumption. Risk propensity is defined as the cumulative general tendency of the individual to either take or avoid risks.

Sitkin and Pablo (1992) and Pablo, Sitkin and Jemison (1996) concluded that risk propensity was a general tendency, rather than a universal propensity, on the part of an individual to take or avoid risks. In other words, individuals are not deemed to have one single risk propensity, rather risk propensity may vary according to the prevailing situation. Another key supporter of risk propensity was Wehrung (1989). Sitkin and Pablo (1992) questioned the validity of prospect theory as an all-encompassing model for observed deviations of risk behaviour. However, they also acknowledged that the framing of the problem was a key determinant of risk perception.

To explain the anomalies Sitkin and Pablo (1992) juxtaposed previously unrelated research to compare risk propensity (risk-averse behaviour versus risk-seeking behaviour) against risk perceptions (positive perceptions versus negative perceptions). They proposed alternative theories such as *threat-rigidity* (Staw, Sandelands & Dutton, 1981) and *hypervigilance* (Janis & Mann, 1977) to explain risk-averse behaviour in a negative frame and *attention to opportunities* (March & Shapira, 1987) for risk-seeking behaviour in a positive frame. Threat-rigidity (Staw, Sandilands & Dutton, 1981) hypothesises that when an individual perceives a situation to be threatening the result will be conservative, risk-averse behaviour. Threat-rigidity was found to be more closely linked with considerations of uncertainty and uncontrollability while prospect theory was linked with the consideration of loss (Ocasio, 1995). Hypervigilance (Jannis

& Mann, 1977) also posits that when a situation is perceived in negative, threatening terms an individual will exhibit risk-averse behaviour. Therefore, when a threat is perceived, decision makers are more likely to respond in a conservative or protective manner, preferring to remain with the status quo (Palmer, Danforth & Clark, 1995). Attention to opportunities (March & Shapira, 1987) is based on the premise that when an individual perceives a situation to be positive, they will focus their attention on the opportunities inherent in that situation and will exhibit risk-taking behaviour.

Sitkin and Weingart (1995) found that risk propensity and risk perception moderated the effect on risk behaviour of framing and Pablo (1997) demonstrated that risk propensity influenced risk behaviour by moderating the perceived characteristics of a situation. These findings highlight the importance of risk perception in the decision-making process. Clearly, the framework that Sitkin and Pablo (1992) developed provided an explanation for observations of risk behaviour that contradicted the predictions of prospect theory. Of the two major theories discussed in this section, prospect theory is useful to predict risk propensity and image theory provides insight into risk perception, which has been shown to moderate risk propensity. These two theories are incorporated in the theoretical model proposed in Chapter 4.

Summary of Cognitive Theories

Cognitive biases are assumed to enter the decision process through the individual's reliance on biased heuristics (Etzioni, 1988, 118). The models discussed may be viewed as cognitive heuristics that are basically information-processing shortcuts (Wang, 1996a) which appear to be efficient and yet still seem to lead to systematic decision biases and errors (Kahneman, Slovic & Tversky, 1982). Inherent in the heuristic approach is the idea that in coping with uncertainty, individual decision makers use some form of judgmental heuristics as general strategies for simplifying complex decision tasks. As a result of this over-simplified view of information processing, there is an emphasis on the limited capacity of cognitive processes. The theoretical models subjected to application and review provided suitable avenues for continued research. From the models presented in the literature, prospect theory and image theory, are the most commonly applied theories concerning behavioural analysis of decision making and therefore were used in this research study.

Applications to Management Accounting

Behavioural research in accounting differs from the economics and finance research tradition in a number of ways (Watts, 1995). First, the focus is on the decision-making process of the individual, rather than imposing the notion of maximizing expected utility as the overriding calculus. Second, behavioural research in accounting tends to use laboratory experiments or surveys, as distinct from economic research which focuses on observation and econometric techniques. Third, behavioural research in accounting draws from a diverse number of disciplines, such as cognitive and social psychology.

Contextual Factors in Decision Making in Accounting

Factors not otherwise explicitly considered in the behavioural theories of decision making under uncertainty influence the degree to which individuals become more or less susceptible to the sunk cost effect. An awareness evolved that contextual factors influence decision making in systematic and predictable ways in a variety of decision-making contexts (Neale et al, 1987; Greenburg & Greenburg, 1997) for example: accounting knowledge and opportunity costs (Vera-Munoz, 1998); acceptance of total quality management (Fok, et al., 2000); entrapment in waiting situations (Rubin & Brockner, 1975); and ambiguity preferences (Curley & Yates, 1985). Greenburg and Greenburg (1997) examined three contextual variables with regard to transfer pricing decisions: the cost situation (increased cost versus decreased costs), the role of the player (buyer versus seller) and the prior relationship between the players (positive versus negative).

A few issues need to be discussed before moving ahead to the application of prospect theory and image theory in the management accounting context. The following sections explore sunk cost and accounting information, opportunity cost, and the interplay between sunk cost and opportunity cost.

Accounting Information Processing

A problem with early accounting decision research is the reliance on an input-output paradigm. The input-output paradigm takes the simple view that information is the input

that is then processed under some form of analysis which leads to the decision, or the output (Mock, 1976, 141). It is acknowledged that decision making involves processes more complex than the input-output paradigm can accommodate. An early attempt was made by Ijiri, Jaedicke and Knight (1966) to establish a basis for researching the role of accounting information through the use of a linear model of decision making. This approach did not provide a useful framework since the model was concerned more with the information and resultant decision than with the process itself.

The decision-making processes of individuals are of particular importance to the design of accounting information systems (Libby & Lewis, 1977). Research on patterns of information processing found that individuals adapt their processing patterns according to changes in the characteristics of the decision problem (Payne, 1976) as well as different decision environments (Payne, Bettman & Johnson, 1993). The work of Driver and Mock (1975) introduced the "human information processing system". They focused on the decision style of individuals with the intention of determining the most suitable accounting system to provide for information needs. The problem was that in an organisation in which a number of decision makers existed, consideration of moderating or confounding variables— such as the existence of more than one decision style— was lacking. These findings provided evidence that there are individual differences in the way people respond to risk, their attitudes toward money, and their patterns of information processing during decision making.

Costing Dilemmas

The argument concerning the exact nature of a sunk cost is in need of clarification. As defined in Chapter 2, a sunk cost is devoid of value at the point in time when a decision is to be made. This poses a quandary, since an item may well have value in terms of continued use. What then, is the nature of the value that is implied in the economic definition and assumed in management accounting? In an endeavour to understand this anomaly, the following example is proposed. This scenario is based on observations of people's behaviour.

Example 3.1

Sunk Cost Decision Scenario

A person is intent on buying a new car. The choice is narrowed down to 2 particular models; a Mazda 323 and a Mazda 626. A decision is made and the new Mazda 323 is purchased at a cost of $20,000. One week later the person decides that the Mazda 323 is not suitable; it is too small, and under powered (it really does not matter what the reasons are since once a person has convinced him or herself that the car is not acceptable any number of reasons could be found).

As a result the person returns to the dealership from whom the car was purchased and seeks to trade the existing Mazda 323 for a new Mazda 626. However, the trade allowance placed on the Mazda 323, even after much negotiation, is $19,000 which is $1,000 less than the price paid just one week prior. This causes some degree of unease, tension and uncertainty within the person. In effect, this means that in order to attain the Mazda 626 the person must now accept a loss of $1,000. The important issue is how much value the person places on the alternative– which is the Mazda 626. If there is a perceived greater value (utility) then the rational choice should be to buy the new car and ignore the $1,000 loss, because it can not be recovered.

Conclusion – the $20,000 is a sunk cost, the market value of the asset is $19,000 therefore the decision facing the person is whether to put this $19,000 towards the purchase of a new Mazda 626.

Note, the $20,000 cannot be recovered as even if the person attempts to sell the vehicle privately, a buyer is not likely to pay the exact same price for the vehicle when they could just as easily go to a dealer and buy a new vehicle. In other words, there is no incentive to buy the car at full price. The Mazda 323 still has value it is just that the value has reduced as far as exchanging it for a new Mazda 626.

This example makes the point that a sunk cost is the past value of an item and the present market value is the only relevant consideration in making a decision. Another interpretation is that the utility or value perceived in an alternative is an opportunity cost. This means that the opportunity cost in this circumstance is related to the utility foregone if the choice is made not to purchase the desired vehicle. Utility does not have to be expressed in terms of profits nor in dollar value. There may well be other factors

that underlie the reasoning for preferring one option to another. These factors may be contextual to the decision being faced or to the person making the decision.

Costing in Economic Theory

The literature regarding sunk cost and opportunity cost suggests that the two types of costs are related— an opportunity cost today will become a sunk cost tomorrow (Ansic & Keasey, 1994, 185). This raises the question "What about a prospective sunk cost?"— for example, when a firm is considering whether to purchase a specialised asset such as an item of equipment. The firm must decide whether the investment in the specialised equipment is cost-effective. An issue for consideration is whether the item of equipment is so specialised that it can not be used for any other alternative use. This is a characteristic referred to as asset specificity. Transaction cost economics provides a theoretical framework from which to examine asset specificity.

Transaction Cost Economic Theory

Transaction cost economics asserts that there are rational economic reasons for arranging some transactions one way and some transactions another (Williamson, 1985, 52). Transaction cost economics is distinguished from other forms of economic evaluation by the concept of asset specificity (Williamson, 1985, 52). Asset specificity refers to durable investments that are incurred in support of a particular transaction; the opportunity cost of such an investment is deemed to be much lower in best alternative uses or by alternative users should the original transaction be prematurely terminated (Williamson, 1985, 55).

Five categories of asset specificity were identified by Williamson (1989, 143):

1. *Site specificity, as where successive stations are located in a cheek-by-jowl relation to each other so as to economize on inventory and transportation expenses;*
2. *Physical asset specificity, such as specialized dies that are required to produce a component;*
3. *Human asset specificity that arises in a learning-by-doing fashion;*
4. *Dedicated assets, which are discrete investments in general purpose plant that are made at the behest of a particular customer; and*
5. *Brand name capital.*

Problems with Expected Utility Theory

Violations of Expected Utility Theory

Violations of expected utility highlight the subjective nature of decision making in real world settings. The subjective nature of the various anomalies suggest that the underlying principles are more likely to restrict research than to provide explanations of actual decisions (Schwartz, 1998, 93). This normative assumption of utility maximization as a description of rational decision making was refuted by recent research (Bagozzi, 2000). Herrnstein (2000, 356) observed that the utility maximizing paradigm *"...accounts only poorly for actual behaviour"* with violations reported with regard to the discarding of sunk costs, judgement of fairness, escalation of commitment and principles of marginal analysis.

The main focus of utility theory (explored in Chapter 2) is to explain consumption at the level of the individual decision maker. Keen (2001, 22-53) provided a critique of the inconsistencies of utility maximization. In order to better understand this phenomenon, Ellsberg (1961) proposed that probability ambiguity gave rise to choice behaviour that was inconsistent with expected utility theory. He found that individuals were often ambiguity-averse (that is, they preferred risk to ambiguity). In view of these findings, Machina (1987, 1999) showed that expected utility theory failed a variety of empirical tests. Bagozzi (2000, 95) suggested that research should include the psychological conceptualisations of behaviour.

Subjective Expected Utility Theory

Frisch and Clemen (1994) credited Savage (1954) with developing "Subjective Expected Utility Theory" by modifying and extending expected utility theory to cover circumstances in which probabilities are not given. Subjective expected utility arrives at the same maximum expected utility decision rule; however, the probabilities are the decision maker's personal or subjective probabilities for uncertain outcomes. Hence, the subjective nature of the expected utility is relevant to outcomes. A more extensive discussion of subjective expected utility theory and expected utility theory is found in von Winterfeldt and Edwards (1986).

Explaining the Sunk Cost Effect

Research suggests that the rational decision model posited by normative theory overlooks the influence of an individual's personal biases and cognitive capacity for decision making, thus providing a number of alternative explanations for the sunk cost effect. The rationale for the observed behavioural differences varies from the desire to avoid waste (Arkes & Blumer, 1985); the commitment to and need to justify prior decisions (Staw, 1981; Brockner, 1992); and the tendency to be risk-seeking as a result of previous losses (Whyte, 1986; Garland & Newport, 1991). Sunk costs, therefore, may be viewed as appearing relevant rather than irrelevant to decision makers in certain circumstances.

Staw (1976) and Whyte (1991) found that the sunk cost effect was more likely to occur when the decision maker felt personally responsible for negative consequences which might result from the original decision. In contrast, Simonson and Nye (1992) found that accountability for prior decisions decreased the sunk cost effect. However, these results were questioned by Larrick, Morgan and Nisbett (1990) on the grounds that the findings were likely biased by the use of business students as subjects who were formally trained to avoid sunk costs. In addition, Arkes and Blumer (1985) found no consistent relationship between the sunk cost effect and responsibility for the decision. The findings from these studies indicate that the relationship between sunk cost behaviour and personal responsibility remains unclear and requires further investigation.

Baron (1999) suggested that the inclusion of sunk cost information in a decision is a cognitive bias in decision making. If all factors on which the decision is based are equal, then greater utility should be achieved by ignoring past costs and focusing solely on future consequences. In cases involving sequential decisions, Arkes and Blumer (1985) identified a behavioural bias and found that individuals do include sunk costs in their evaluation process. In such cases, they found there was a tendency to *escalate* the commitment of resources, despite the existence of information suggesting such a decision had a high probability of failure. However, observed sunk cost behaviour might indeed *be rational* when the decision is to avoid waste. This implies that the behaviour is rational in the sense that there is an increase in overall utility by including sunk costs. The increase in utility in this case is due to minimizing loss.

Roodhooft and Warlop (1999) studied the role of sunk cost information in a common management accounting scenario: the decision to outsource or to continue with internal production. This decision scenario is a "make or buy" decision; one with which most accountants are conversant. They found three significant influences with regard to an outsourcing decision task presented to hospital managers. First, asset specificity had an influence on the decision process. Second, sunk cost information also influenced the decision not to outsource. Third, prior commitment to internal production systematically reduced the willingness to outsource. The scenario provides further opportunities to examine the relationship between sunk cost and framing effects within a task that is relevant to current decision-making trained financial professionals, such as managers and accountants.

Examples of the Sunk Cost Effect

A classic example of the sunk cost phenomenon demonstrating irrational decision making was developed by Thaler (1980). In his example, a prominent individual paid $5,000 to join a major tennis club and developed tennis elbow after a short period. Rather than give up tennis in favour of a less strenuous sport, the individual persisted with tennis, thus refusing to quit. The individual continued to the point of incurring medical and pharmaceutical costs far in excess of the $5,000 sunk cost to join the club, not to mention incurring intangible social costs of pain and suffering. Normative theory suggests that this behaviour is irrational because sunk costs should not be a consideration in the decision taken as to whether or not to give up the sport.

Business literature deals with sunk cost under two broad categories. First, there is an approach which is concerned with the physical magnitude of the sunk cost in comparison to the size of the firm or the project. For example, a sunk cost of $10,000 to managers of a large firm with total assets of $10,000,000 would consider the sunk costs to represent a small percentage of total capital. However, the same sunk cost amount of $10,000 to a firm with only $100,000 total assets represents a much larger percentage of total capital. The risk and the potential loss looms larger for the small firm than for the large firm. The concept that "*losses loom larger than gains*" is a pivotal notion raised

by Kahneman and Tversky (1982); it was suggested that this principle will impact on the decision-making process.

Second, there is an approach where issues pertaining directly to the decision maker are more complex; there may be any number of factors underlying the individual's process of rationalising a decision. One such factor is the notion of self-interest. Self-interest underpins the theory of utility maximization and suggests that survival is a strong motivating factor in the explanation of human behaviour. Other issues pertaining to the decision maker take into consideration the personality or cognitive attributes of the individual in order to provide an explanation of the decision-making process. This category of research primarily relies on the economic model of utility maximization to explain the expected use of sunk cost information.

Finally, there is the theory that individuals tend to treat gains and losses asymmetrically (Fershtman, 1996). To explain this concept in the framework of prospect theory, the aggravation that a person "*... experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount*" (Kahneman & Tversky, 1979, 279). This phenomena is also referred to as loss-aversion. Loss-aversion involves the integration of the decision rather than the segregation of the decision which results in a decision under sunk cost.

Prospect Theory and Utility Issues

Prospect theory is a descriptive model of decision making capable of explaining violations of normative decision theory. A distinguishing feature of the theory is the utility function. Under prospect theory, the utility function is defined as changes in wealth relative to a reference point, unlike the utility function in expected utility theory which is simply defined as final wealth states (Kahneman & Tversky, 1979, 277). The reference point is usually assumed to correspond with the status quo or an individual's current asset level (Kahneman & Tversky, 1979, 286). Prospect theory further posits that in certain circumstances the reference point can be affected by the manner in which alternatives are expressed— a phenomenon known as framing (Tversky & Kahneman, 1981, 453).

Expected utility theory assumes that all decision makers are risk-averse (March, 1988a, 5; Rabin & Thaler, 2001, 219). This means that a decision maker has a utility function that is uniformly concave or that departure from risk-averse behaviour will only occur under unusual circumstances (Altaf, 1993, 91; Rabin, 2000, 1282). Under prospect theory, the value function is assumed to be steeper in the domain of losses than in the domain of gains, suggesting that losses have greater subjective impact than gains of an equivalent magnitude (Kahneman & Tversky, 1979, 279). Research relating to decision-making in finance has focused on the tendency by investors to sell assets that have gained value (winners) and retain assets that have lost value (losers) (Shefrin & Statman, 1985). The main concern of financial behavioural research is loss aversion. The study of this phenomenon can be found under the names of disposition effect, status quo effect and endowment effect (discussed earlier in Chapter 3).

Summary of Decision Factors in Prospect Theory

Prospect theory attempts to explain aspects of decision behaviour (irrational behaviour) that violate expected utility theory. Prospect theory differs from expected utility theory because the theory proposes that an editing phase occurs in the decision-making process. The editing phase serves to reduce the cognitive requirements in the evaluation of decision alternatives or prospects. This is achieved through reformulating prospects through several editing operations (Kahneman & Tversky, 1979, 274). The reformulation, in turn, affects the decision frame and ultimately the decision reached.

The evidence suggests that in conditions of choice under uncertainty, the structure of tasks not only causes inconsistencies in expression of preference, but actual consistent reversals of preference. A number of factors are indicated as affecting an individual's capacity to make choices. The factors appear to be the complexity of the task as represented by the number of alternatives and the number of dimensions per alternative; the extent to which dimensions are commensurable; the order of information presentation (viewing alternatives in sequence versus simultaneous presentation of the information); missing information concerning dimensions on particular alternatives; familiarity with the kind of decision task; and the importance of the choice (Hogarth, 1980).

Applying Prospect Theory

The issues pertaining to prospect theory raised in the literature may be categorised according to three general areas of interest. The first area is research concerned with the testing of the underlying constructs and modelling of the influences in the decision-making process. The second area is research which tests the existence of the phenomenon, in particular the impact on decision making of sunk cost, opportunity cost, and escalation to commitment. The third area is research that questions constructs or introduces alternative frameworks focused on particular aspects within prospect theory or the failings of prospect theory.

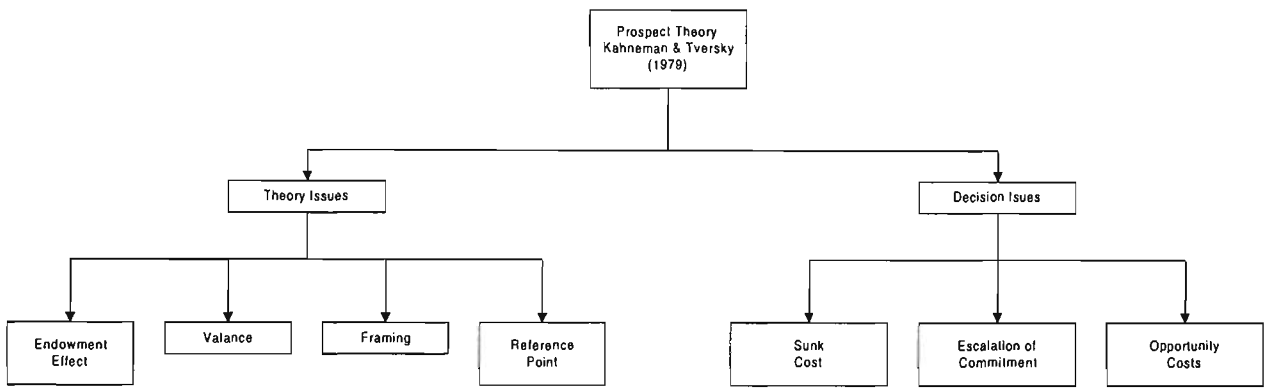
The manner or context in which information is provided represents a potential source of bias that may affect the decision maker's formulation of the problem, the decision frame adopted, and ultimately the decision choice. Studies such as Staw and Ross (1978) considered the possibility of personality and motivations in examining the relationship between decisions and cognitive ability. However, the relationship was marginalized or discarded for the lack of a valid instrument and the difficulty in applying psychological tests with so many subjects involved. Staw and Ross (1978, 60) concluded:

> *The present data did not show any consistent effects of personality variables on investment behaviour and unfortunately provided few research leads in this area... Some caution must be exercised in coming to this conclusion, however, since these personality scales were not administered to the entire sample and the instruments varied in their internal validity.*

In essence, prospect theory represents one component of a jigsaw puzzle concerning decision making involving the sunk cost effect. Other theories provide further snippets of the puzzle, yet even when these are assembled together they are not completely representative of the reasons for observed irrational behaviour. Behavioural theories offer a tantalising one-sided view that is concerned with cognitive issues and heuristic processing models. However, even the limited opportunities offered by behavioural theories are far more enticing for empirical research than research employing motivational theories.

Figure 3.8 presents an overview of two main streams pertaining to the constructs and their variations, which evolved from research concerning prospect theory.

Figure 3.8
Prospect Theory's Underlying Issues



Reference Point in Prospect Theory Applications

The reference point is the point from which the individual assesses the starting point for their value function according to prospect theory. The reference point can be neutral or it can be influenced by the perceived present position in terms of wealth. Sunk costs have been shown to influence the reference point in terms of escalation to commitment.

Framing Effect in Prospect Theory Applications

The framing effect also plays an important role in prospect theory. By introducing the concepts of gains or losses an individual's value function can be influenced so that the commitment to a course of action can be explained in terms of the framing effect. The following steps are identified in Figure 3.9.

Step 1
Create a task with a reference point that includes a sunk cost.
- This identifies the reference point for the decision maker
- This assist in measuring the framing effect

Step 2
Create two versions of the task by incorporating a framing effect such as gains or losses.
- A decision maker confronted with the different task frame should now perceive the situation differently from the same reference point

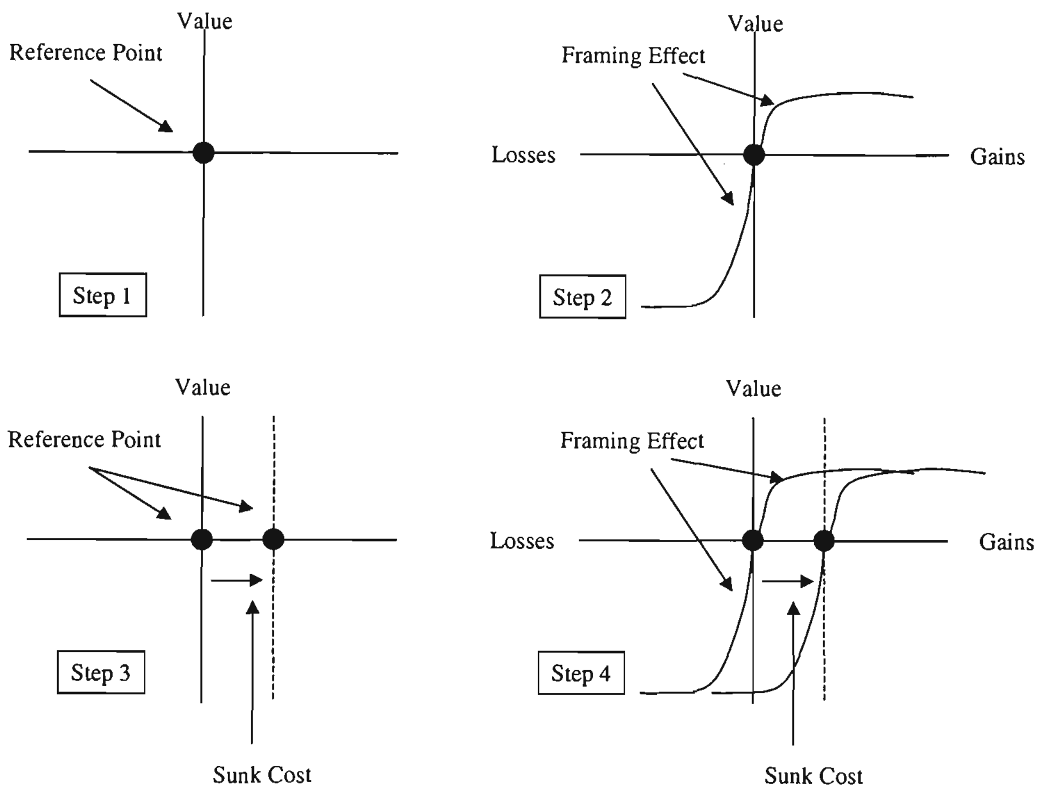
Step 3
Duplicate the task; however, change the sunk cost amount which should move the reference point.
- This provides a different reference point from which a decision maker is likely to perceive the task.

- This assists in measuring the influence of the sunk cost effect

Step 4
Duplicate the task and change the sunk cost amount which should move the reference point and produce two versions of each with a framing effect such as gains or losses.

- This assist in measuring the influence of the framing effect at different levels of sunk cost.

Figure 3.9
Framing Effects and Reference Point Manipulation



Applying Prospect Theory to Issues and Questions

Thus, through the investigation of prospect theory undertaken to this point, the following research issues and questions could be addressed.

Why do individuals make irrational decisions? For example, why choose not to outsource when the optimal choice is to outsource?

- To address this type of question, a task specifically designed to address outsourcing decisions can be developed with the inclusion of prospect theory constructs.

Why do individuals escalate commitment to a failing course of action? Reasons may be due to:

- Sunk cost effect, which can be tested in terms of the reference point.
- Framing effect, which can be tested in terms of gains or losses.

Prospect theory provided a model that enabled the sunk cost effect on decision-making behaviour to be tested and measured. The work of Dunegan (1993) provided a useful basis for extending sunk cost research by examining the role of the reference point and the framing effect. Dunegan's scenario encompassed a number of constructs specific to prospect theory and decision making under sunk costs. Scenarios were constructed in context of continued investment in light of sunk cost. This specific research study formed the basis for the empirical surveys undertaken in this research.

Unanswered Problems/Issues of Sunk Costs

Decision research tends to emphasis rational, or at least analytical processes, rather than intuition and holistic thinking. Smith and Kida (1991, 487) argued that *"conclusions drawn regarding specific professional judgements should...be based on investigations using tasks and subjects representative of those contexts."* The research reported in this thesis employed tasks that were contextual to the particular subjects and focused on the effects of sunk cost and opportunity cost information. The effect of age, gender, experience, and expertise of subjects was also examined.

To conclude, there were a number of issues which posed interesting questions concerning the role of framing in examining the sunk cost phenomenon. First, how does experience and expertise affect decision making? Are experts more or less likely to be influenced by framing effects— a matter, which receives scant attention in the literature.

Second, opportunity costs are the antithesis of sunk costs. While sunk costs are past and are irrelevant, opportunity costs occur in the future and are relevant for decisions. This provides an interesting conundrum. Are decision makers really likely to treat the two costs differently in their decision making process?

Contextual factors may also be responsible for observed variations in the sunk cost effect. The literature offered a number of plausible alternatives, the most prominent being expertise, experience and prior knowledge. The proposition that contextual factors may be moderating or confounding variables of the sunk cost effect was examined from the perspective of different professional groups. Three surveys were delineated on the basis of three groups: hospital managers, accountants and financial planners.

Chapter Summary

Behavioural theories offered a broader view of the factors likely to be involved in influencing an individual's cognitive processes when making a decision. The variety of explanations allowed for the existence of a complex world in which events may never be exactly the same. This provided a framework for more insightful research than was possible under the narrow economic perspective of rational decision making. This literature review revealed, contrary to the assumptions espoused by normative theory, that people do not always act in what academics refer to as a "rational manner" when making financial decisions. Sunk cost information *is* taken into consideration by people and results in "irrational" behaviour, such as escalation of commitment. Researchers attempt to explain such behaviour in ways that can be understood using theories that focus on motivation and theories concerned with the cognitive decision process of individuals.

The cognitive theories provided the most compelling evidence concerning the role of sunk cost information. Prospect theory, in particular, provided an insightful structure from which to conduct an empirical analysis. The two main constructs of prospect theory are the reference point against which an individual compares the prospects and the framing effect that relates to the way that those prospects are perceived. The reference point is consistent with the notion of a level of wealth against which gains or losses can be measured. Prospect theory holds that "losses loom larger than gains" so that the negative utility associated with a loss will be greater than the positive utility for a gain of the same amount. The framing effect holds that the way in which a prospect of a decision is framed will influence an individual's propensity for risk. The proposition is that a negative frame for a prospect will cause risk-seeking behaviour while a positive frame will result in risk-averse behaviour.

The literature confirmed the existence of the "sunk cost effect". Issues identified by the review indicated that further research could provide support for the existence of this effect across a wide population of professionals. Prior research tended to employ an experimental method. There was an opportunity to broaden the research through the use of surveys. Replication of prior research in different circumstances on different

populations also provided an opportunity for the validity of the findings and the existence of effects of perceived sunk cost to be explored.

CHAPTER 4
Research Design and Method

Chapter Introduction

This chapter describes the research design and methods used for data collection and analysis. The issues of reliability and validity of the research study were addressed by following a set of tactics at specific stages of the research process and these tactics are presented in some detail. A multiple survey approach involving the replication of prior research was employed to further enhance validity of the survey instruments.

Constructs relevant to the sunk cost effect were operationalised from the literature reported in Chapter 3. Variables in the survey instruments are categorised as independent or dependent according to the structure of the tasks. A framework was implemented to address instrumentation bias and measurement error. Selection of each sample followed a process appropriate for the population size and the intended target population for the sample frame.

Response rates for each survey are reported and were considered to be within acceptable parameters for the nature of the empirical research. Selection of methods for conducting analysis of the data collected were based on classification of variables and statistical techniques deemed appropriate according to the research literature. Details of the statistical methods are also outlined in detail in this chapter.

Overview of Research Design and Method

The procedures and methods associated with survey research were developed and refined over a long period of use in disciplines such as psychology, sociology and statistics (Kerlinger, 1986, 377), as well as in the business disciplines. Survey research is a specific type of field study that involves the collection of data from a sample drawn from a well-defined population (for example, all accountants operating in Queensland) through the use of a questionnaire (Visser, Krosnick & Lavrakas, 2000, 223). Mail surveys as a means of data collection are widely used in accounting research. Surveys are frequently used to obtain perception data from user groups with respect to annual

report content and usage (Courtis, 1989). Three direct mail surveys were used in this research as the means for collecting data.

Types of Survey Research

There are two major types of survey research (Kerlinger, 1986). The first type is "exploratory" in which the objective is to become more familiar with a topic. There is usually no model in exploratory research and the constructs of interest need to be better understood and measured. An exploratory survey is useful in determining, for instance, the benefits that may be associated with adopting new accounting systems and problems that impede its successful implementation. The resulting data is then refined to identify new possibilities or constructs and thus a model or framework for subsequent research is developed. Exploratory surveys are described as indispensable in the early stages of studying a phenomenon due to this potential for theory building (Dubin, 1978). Evolution of research concerning a phenomenon increases understanding or the certainty with respect to knowledge.

The second type of survey research is "explanatory research". This type of survey is directed at finding causal relationships among variables, which is achieved by applying theory-based expectations on how and why variables should be related (causality). Hypotheses may be basic (that defined relationships exist) or may be directional (the relationships between variables are positive or negative) (Kerlinger, 1986). For instance, an explanatory study could explain, hypothesise, and test for a positive relationship between the existence of an Activity Based Costing system and success in cost management. Results then are interpreted and in turn contribute to further theory development or refinement.

The ultimate aim of most survey research is theory development (Fowler, 1988, 1993; Kerlinger, 1986). That is, survey research should better explain or predict a phenomenon. To do so, consistent relationships between the various theoretical concepts need to be established and verified through continuous testing and extension. Kerlinger (1986) recommended that the unit of analysis should be clearly defined from the outset and that all questions in the instruments should be designed to collect information at a level consistent with the specified unit of analysis. The most common survey design is cross-sectional where information is collected at one point in time from

a sample chosen to represent the population. In this research study, the unit of analysis was clearly identified for each survey and the questions were specifically focused at the level of the targeted unit of analysis.

Surveys are used in accounting research because they offer several advantages. They are a cost-effective and efficient means of collecting research data (Courtis, 1989) and large amounts of data can be obtained from a sample (Kerlinger, 1986). They provide a means of collecting information anonymously and from geographically dispersed individuals. Finally, mail surveys provide a way of gathering data from individuals who may not be accessible through other means (Courtis, 1989).

Validity and Reliability of Survey Research

Surveys tend to be weaker with regard to matters of validity and strong concerning reliability (Litwin, 1995). To be valid, a survey needs to be accurate in regards to the measurement of the variable(s), and to be reliable, a survey merely needs to be consistent in the application of the instrument (Fink, 1995c, 4). A valid and reliable survey can yield critical information and provide important insights into the topic being studied (Litwin, 1995).

Validity in Survey Research

Validity refers to the degree to which a survey instrument assesses the constructs that the instrument is intended to measure (Fink, 1995a, 46). A survey's constructs are measurable if two or more people can easily agree on all the words and terms used to describe the purpose of the survey (Fink, 1995c, 2). There are three primary types of validity: construct validity, internal validity and external validity.

Construct validity

Construct validity is a measure of how meaningful the scale or survey instrument is when applied to measure a construct or trait (Litwin, 1995, 43). Construct validity is established experimentally to demonstrate that the survey instrument distinguishes between people who do and do not have certain characteristics (Fink, 1995a, 51). Construct validity may be established in one of two ways:

1. The researcher hypothesises that the new measure correlates with one or more measures of a similar characteristic (convergent validity) and does not correlate with measures of

dissimilar characteristics (discriminant validity). This form of construct validity is most appropriate to instruments that purport to measure attitudes or personality variables.

2. The researcher hypothesises that the measure can distinguish one group from another on some important variable. This form of construct validity is more appropriate to survey instruments that seek to measure differences between groups due to manipulation of the variables within the survey instrument itself.

Internal validity

Internal validity is concerned with the establishment of causal relationships (Fink, 1995a, 49). Internal validity error addresses the question of whether differences in the dependent variable were solely caused by the independent variable (that is, the experimental treatment) or whether other variables could be confounding the predicted relationships (Malhorta & Grover, 1998, 414; Zikmund, 1989, 284). In experimental designs using survey research, it is possible to control extraneous effects on the dependent variable by using experimental controls or by homogenising the sample groups (Malhorta & Grover, 1998, 414; Alreck & Settle, 1985, 68). Formal methods such as follow-up interviews with respondents can eliminate rival explanations for the findings (Malhorta & Grover, 1998, 414).

The specific issues of internal validity are addressed within each of the three individual studies. The systematic replication method added to the validity of the variables and constructs. The random assignment of subjects provided assurance that, at least prior to the study, all groups were equivalent thereby minimising threats to internal validity (Abernathy et al., 1999, 17).

External validity

External validity is concerned with the conditions for generalising the research findings from the sample to the population (Drucker-Godard, Ehlinger & Grenier, 1999, 213). External validity tends to be inversely related to internal validity, because the controls required to improve internal control are often counter-productive to external validity (Robson, 2000, 72). For example, a laboratory experiment provides the best control for internal validity and yet it is difficult to generalise to any setting that does not approximate the laboratory conditions. Since the laboratory setting does not necessarily

reflect the real world, the extent to which the findings validly represent the reality of the outside world are not known conclusively (Sekaran, 1992, 127).

Both quantitative and qualitative research require the sample to be studied and the population targeted to be defined in order to determine the generalisation boundary for the results (Drucker-Godard, Ehlinger & Grenier, 1999). To achieve this, quantitative research draws on the process of statistical generalisation (Yin, 1989). Techniques for improving the level of external validity involve including control variables inn the instrument to delimit and accurately characterise the population being studied (Drucker-Godard, Ehlinger & Grenier, 1999).

Reliability in Survey Research

Reliability of a survey is determined by assessing the level of possible "error" (Fink, 1995a, 46). In survey research, there are two possible types of error, random error and measurement error (Litwin, 1995, 5). Random error is primarily related to the representative nature of the sample and is addressed by sampling techniques. Measurement error concerns the degree of precision or lack of precision with which a particular variable is measured within the survey instrument (Litwin, 1995).

Controlling for Validity and Reliability

Table 4.1 summarises the tactics adopted to control for validity and reliability. The tactics derived from suggestions for controlling and improving validity and reliability of research in general (Kerlinger, 1986; Sekaran, 1992) and survey research in particular (Fink, 1995a, 1995b; 1995c; Litwin, 1995).

Table 4.1
Tactics to Address Validity and Reliability Issues

Issues	*Tactical approach*	***Research Phase***
Construct Validity	(1) **Convergent** ~ show that measures that should be related are in reality related. (2) **Discriminant** ~ show that measures that should not be related are in reality not related.	(1) Statistical analysis of data stage. (2) Statistical analysis of data stage.
Internal Validity	(1) Control extraneous effects on the dependent variable by using experimental controls or by homogenising the sample groups; (2) Observation of multicollinearity among the variables can eliminate rival explanations for the findings.	(1) Design of survey instrument stage. (2) Statistical analysis of data stage.
External Validity	To generalise the results from the sample to the population: (1) sample error ~ representative sample from known population; (2) statistical power ~ application of appropriate statistical methods.	(1) Selection of sampling method. (2) Selection of statistical methods.
Reliability	(1) Be specific regarding the target respondent in the cover letter; (2) Incorporate questions in the survey which attempt to identify if, in fact, the target respondent was the person completing the questionnaire.	(1) Design and creation of correspondence. (2) Selection and design of instrument.

Multiple Survey Approach

The notion of a multiple survey approach was based on the more common research designs identified as multiple-experiment (Hersen & Barlow, 1976) and multiple-case study (Yin, 1994). The evidence derived from multiple-experiments and multiple-case studies is generally considered more compelling and robust (Herriott & Firestone, 1983) because of the analogy with confirmation provided by replication of a study (Yin, 1994).

Designing Multiple Surveys

To satisfy the requirements of a multiple survey approach, the same concepts of conducting a replication or comparative study apply. That is, the variables being examined and measured need to retain a certain level of consistency and conformity allowing for any changes that are necessary due to contextual issues pertaining to the different sample (Robson, 2000, 73). Replication of a study with a different target population is a method of assessing reliability of the findings; however, in practice no replication is ever exactly the same (Robson, 2000, 73).

Validity of Replication Studies

Various textbooks concerned with research methods refer to replication as integral to the justification and strength of scientific and empirical research (Huck, Cormier & Bounds, 1974; Sekaran, 1992). Successful replication provides confidence in the original findings and may lead to further insights into the phenomenon being studied. Graziano and Raulin (1997, 205) raised the issue of replication of prior research as a general control procedure to increase the validity of findings. Replication provides criterion validity by providing evidence in support of the findings of the previous research. If the particular phenomenon cannot be readily replicated, then *"we must ask whether they exist at all"* (Graziano & Raulin, 1997, 205).

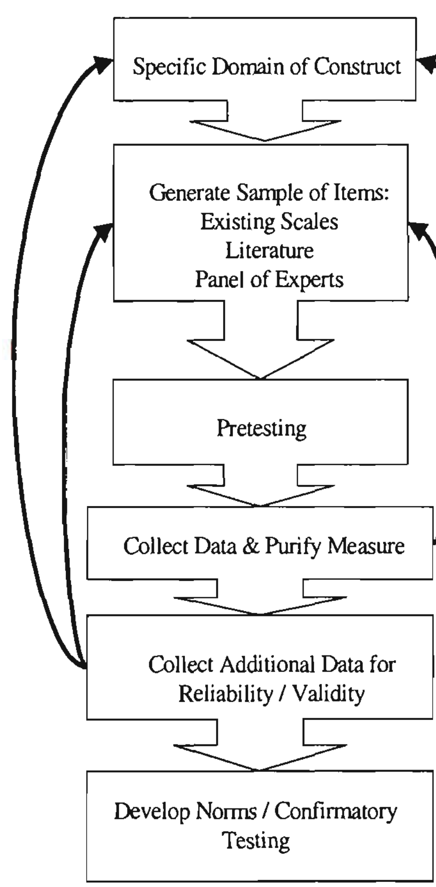
Sidman (1960) suggested four distinct methods or techniques for replication involving the use of different subjects. The first technique is inter-group replication and involves the application of the same research method to two or more different groups. The second technique is inter-subject replication and involves the application of the same experimental design and independent variable to two or more subjects or individuals. The third technique is intra-group replication and involves a repeated application of different processes or experimental conditions to the same group. The fourth technique is intra-subject replication and involves the repeated measurement of the same subject for at least two or more experimental conditions.

Sidman (1960) also suggested two types of replication for research activity itself: direct and systematic. Direct replication involves the exact replication of procedures in a replicated study. This demonstrates the generality of procedures being used. Any of the four techniques of replication may also be applied with direct replication. Systematic replication involves making slight modifications to the independent variable(s). This gives the researcher the same advantage of generality while yielding additional information, not otherwise obtainable from a direct replication. Systematic replication may also be called quasi-replication since other techniques or research strategies can be employed to investigate the same phenomenon. The approach adopted in this thesis was consistent with the systematic type of intergroup replication. Replication of prior research was conducted using different groups with slight modifications to the independent variables.

Measurement Error

Measurement error may be one of the most significant sources of error in survey research (Churchill, 1979). Inappropriate measurement can be due to a number of factors including poorly worded questions, length of the instrument and bias induced by inappropriate method. While measurement error is almost inevitable, the primary question for researchers is the extent to which these errors affect the findings. Fortunately, validation techniques are available to reduce measurement error. A framework for doing this, modified from Churchill (1979) was used in the research to control for error. The process outlined in Figure 4.1 is applicable to multi-item measures of a variable (Churchill, 1979, 66). To insulate the survey instruments against systematic bias and random error, the steps recommended by Alreck and Settle (1985, 113) were also followed.

Figure 4.1
Framework for Addressing Measurement Error



Source: (Adapted from Churchill , 1979)

Detailed attention to instrumentation through careful questionnaire development in survey research promoted cooperative efforts and permitted confirmatory follow-up

researchers to use a proven and valid instrument. Validated instruments of both independent and dependent variables alleviated possible confounding effects in determining the true relationship among variables.

Use of Prior Research

Prior studies established various approaches to identify and test the relationships between the variables used in this research project. The review of literature in Chapters 2 and 3 provided the justification for the gathering and analysis of the data using instruments from prior studies. For the first survey, the task was an outsourcing decision. Due to the differences between hospital managers and accountants, there was a variation in the nature of the outsourcing task. For Survey 1 (hospitals), the task details related to outsourcing of food catering by the hospital, while in Survey 3 (accountants), the task details related to outsourcing of the payroll function of a large organisation. Full descriptions are provided in Chapters 5 and 7 and the instruments are presented in the Appendix. In the second (financial planners) and third (accountants) surveys, the task was concerned with the investment of funds to an existing project. Due to the differences between accountants and financial planners there was a variation in the description, but not the nature, of the investment task.

Triangulation in Multiple Studies

Triangulation was broadly defined by Denzin (1978: 291) as *"the combination of methodologies in the study of the same phenomenon."* The use of triangulation can be traced back to the concept of "multiple operationalism" introduced and applied in the social sciences by Campbell and Fiske (1959). The concept is a metaphor derived from military strategy and navigation that involves the use of multiple points of reference to locate an object's exact position (Smith, 1975, 273). Conceptually, triangulation involves the collection of different types of data and different methods of analysis which provides for the validation of judgements pertaining to the phenomenon being examined. Therefore, agreement between methods increases the level of reliance on the results as being valid and not merely due to the method (Bouchard, 1976). Belkaoui (1987) introduced the concept of triangulation to the discipline of management accounting research as a useful means for testing the veracity of theories and the underlying constructs.

Design of the Survey Instruments

In order to conduct the multiple surveys, the instruments, or questionnaires, were constructed to operationalise the construct of sunk costs in the context of decision-making tasks. This section outlines the variations in the instruments adapted from prior research for use in this thesis. Then, the issues of validation and pre-testing of the instruments are addressed.

Operationalising the Constructs of Sunk Cost

The constructs investigated in this thesis were derived from the theory and research reviewed in the literature as reported in Chapters 2 and 3. The overall approach to the constructs involved the use of tasks that incorporated sunk cost information pertaining to an outsourcing task and an investment task. Table 4.2 summarises the constructs included in the tasks across the three surveys.

Table 4.2
Overview of Tasks and Subjects

	Subjects	***Decision/Focus***	***Constructs***
Survey 1 (Chapter 5)	Public Hospital Management; Private Hospital Management	Outsourcing decision (Make-or-Buy)	Sunk Costs; Asset Specificity (Transaction Cost Economics)
Survey 2 (Chapter 6)	Financial Planners in Public Practice	Investment decision (problem space inventory elements)	Sunk Costs; Opportunity Costs; Framing (Positive/Negative).
Survey 3 (Chapter 7)	Accountants in Public Practice	(1) Outsourcing decision (Make-or-Buy); (2) Investment decision (problem space inventory elements)	Sunk Costs; Asset Specificity (Transaction Cost Economics); Framing (Positive/Negative).

The constructs addressed in each survey are discussed in more detail in the appropriate chapter (Chapters 5, 6 and 7) together with a minor literature review, development of the null hypotheses and method discussion. Further issues pertaining to validity are also presented within each of these chapters. The basis for the operationalisation of the constructs used in these surveys, with the details of the prior research from which they were derived, are presented in Table 4.3.

Table 4.3
Summary of Major Constructs Operationalised in the Surveys

Construct	*Operationalised*	*Category*	*Levels*	*Prior Research*
Sunk Cost	Past cost or prior investment.	Treatment effect.	High; Low; Nil.	Arkes & Bulmer, 1985; Staw, 1976
Framing	Manipulation of wording.	Treatment effect.	Positive; Negative; Nil (neutral).	Kahneman & Tversky, 1979
Problem Space	Likert scale questions.	Independent (predictor)	8 separate questions.	Payne, 1985; Dunegan, 1993
Image Compatibility	Likert scale questions.	Independent (predictor)	4 separate questions.	Beach, 1990; Dunegan, Duchon & Ashmos, 1995
Outsourcing Decision	Decision task.	Dependent (criterion)	2 choices: 1- Internal (make) 2- Outsource (Buy).	Roodhooft & Warlop, 1999
Investment Decision	Decision task.	Dependent (criterion)	Multiple choices: from $0 to $100,000.	Dunegan, 1993

Independent Variables

The independent variables used in the survey instruments were sunk cost information and framing of the task. Manipulation of the sunk cost information was included as "high sunk cost", "low sunk cost" or "nil sunk cost". The framing of the task was also manipulated by provision of information categorised as: "successful" (positive), "unsuccessful" (negative) or "nil". Framing was not employed in the outsourcing task applied to hospitals in Survey 1. A further independent variable was asset specificity which was applied to the outsourcing task for both hospitals (Survey 1) and accountants (Survey 3). The asset specificity manipulation was categorised as either being "present" or "not present" in the task.

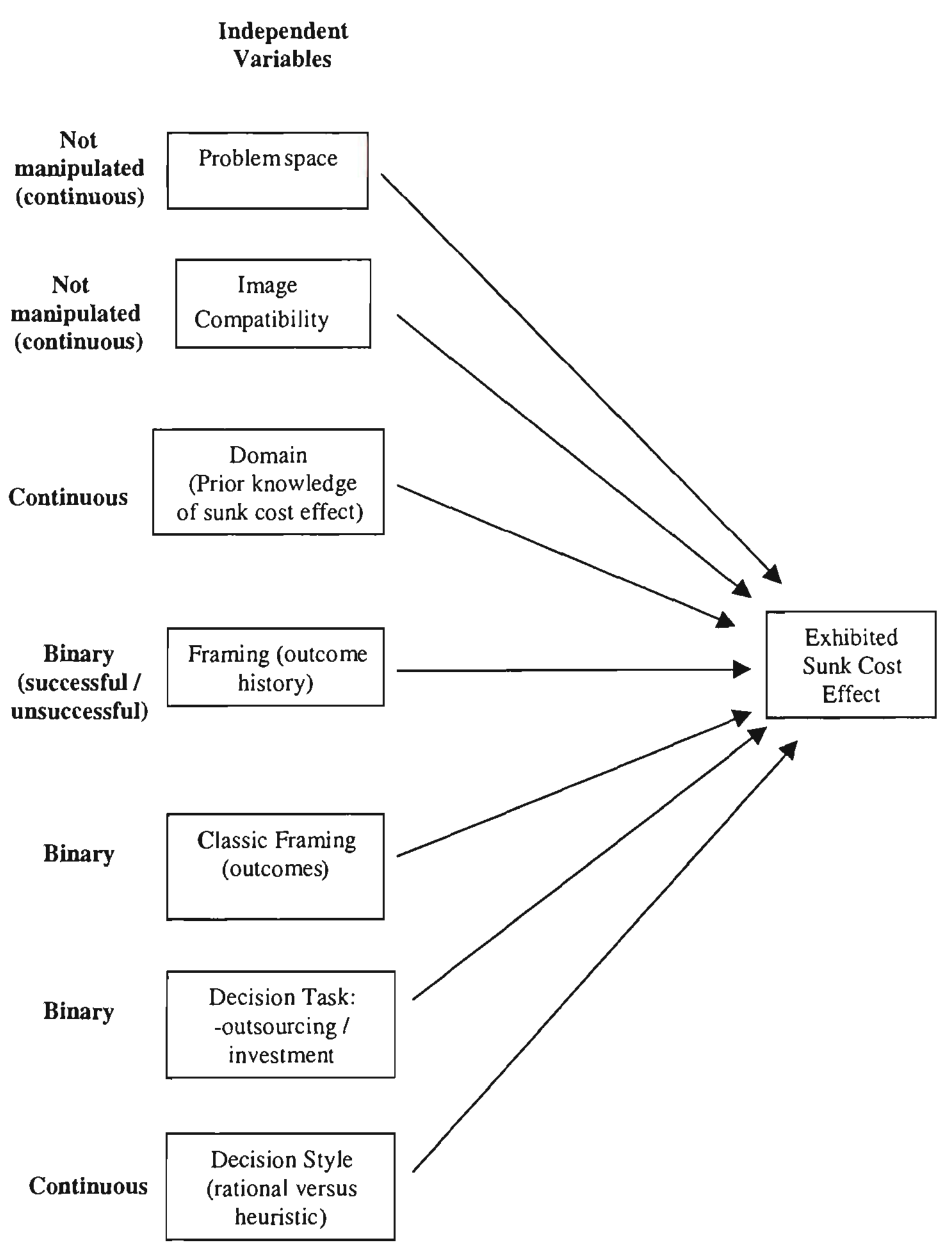
Dependent Variable

The dependent variable in the surveys was the decision made by the subject. In the outsourcing task, a binary decision was involved. Subjects were required to choose between internal production or external outsourcing; this type of task is consistent with the traditional "make or buy" task in management accounting. In the investment task, the decision was to allocate from $0 to $100,000.

Classifying Variables in the Multiple Studies

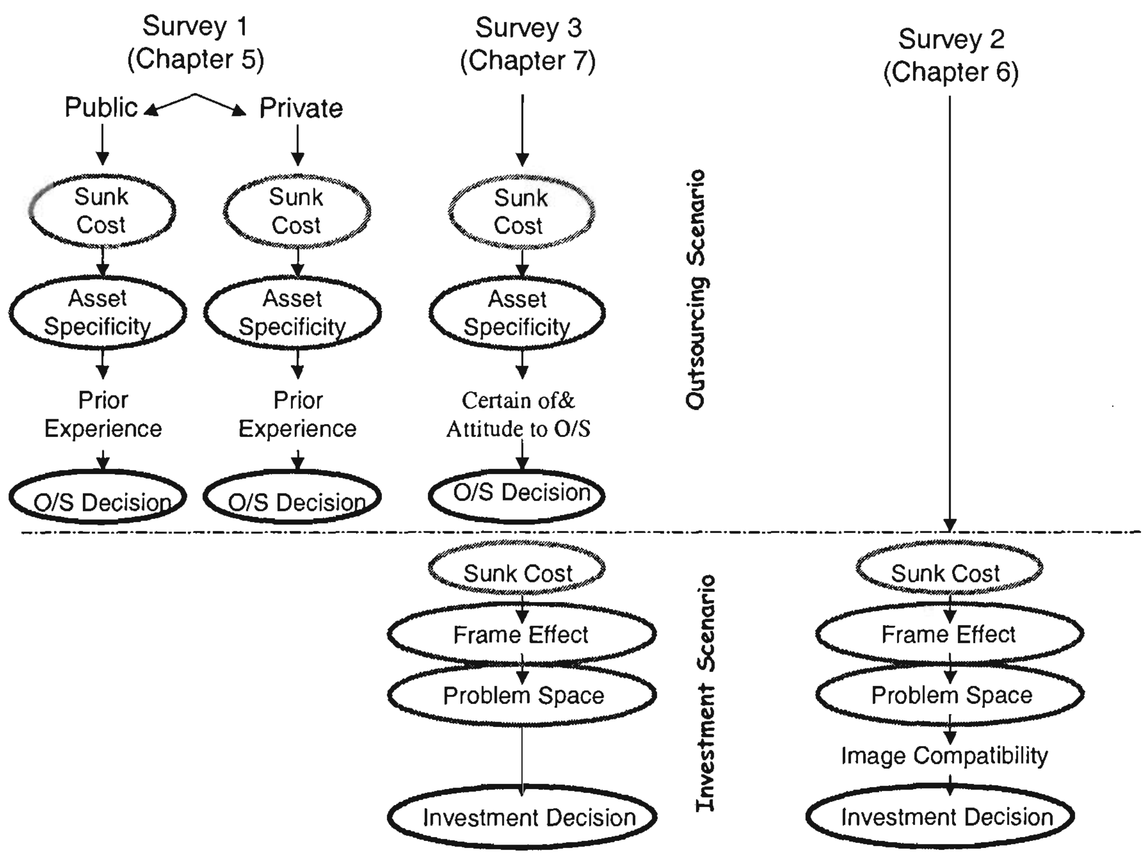
The research design took into consideration a number of variables that were shown in prior research to be representative of sunk costs and related to the treatment of sunk costs. Figure 4.1 depicts the sunk cost construct with the classification details of the variables used to examine the sunk cost phenomenon. Sunk cost information in the survey tasks was manipulated as being present or not present. In order to test the strength of the sunk cost effect, a further manipulation involved a lower amount of sunk cost. Against this backdrop of sunk cost information, Figure 4.2 shows that a number of independent variables were also employed.

Figure 4.2
The Overarching Classification of Variables



The variables presented in Figure 4.3 are identified according to the decision task and the diagram demonstrates the consistency in variables across the three surveys.

Figure 4.3
Comparison of Constructs Examined Across Chapters



Theoretical Research Model

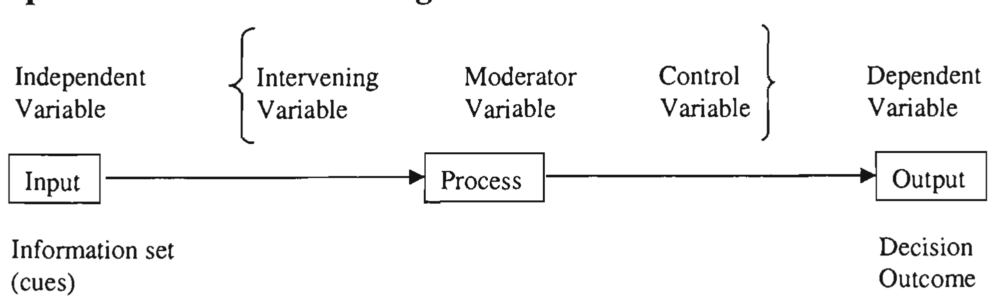
Having established the degree of consistency across the survey instruments the next issue was the conceptualisation of the theoretical model underpinning the research. Peters (1993, 385) suggested that a strategy of combining models and theories would strengthen the understanding of accounting decision making. This research structure was designed to test the combination of a model (the information processing model) and theories (prospect theory, image theory and expected utility theory) as suggested by Peters (1993).

Prior research did not conceptualise how behavioural theories of decision making could be synthesised with an information processing model to test rational choice within the context of financial decision making. The rational decision making model assumes that

decision makers are guided by the available information (Heracleous, 1994; Hogarth, 1980). According to Simon (1979) decision makers are assumed to have acquired all available information, as information plays a key role in reducing uncertainty (March, 1988b). Prior research has not established the role that information plays in rational choice (Rich & Oh, 2000). The argument in this thesis is that information is affected by a variety of factors, which in turn influences the degree of uncertainty and the perception of risk. By combining the information processing model with behavioural theories, a research model was developed for testing the predicted rational choice.

There were three stages to the development of the theoretical research model. The first stage was to define a simple information-processing model that could be applied to study the variables of rational choice. The information-processing model (Figure 4.4) was derived from Libby and Lewis (1977; 1982). This model provided the initial basis for testing constructs from behavioural theories, as reported in Chapters 5, 6 and 7. The information-processing model assumes that when an individual is confronted with a choice, the input is the relevant information set or data which is combined or processed by the individual to choose from among the alternative courses of action (prospects) (Libby & Lewis, 1977). The model focuses on the ability of decision makers to use the information presented. In this regard, the model was consistent with the objective of this dissertation.

Figure 4.4
Simple Information Processing Model

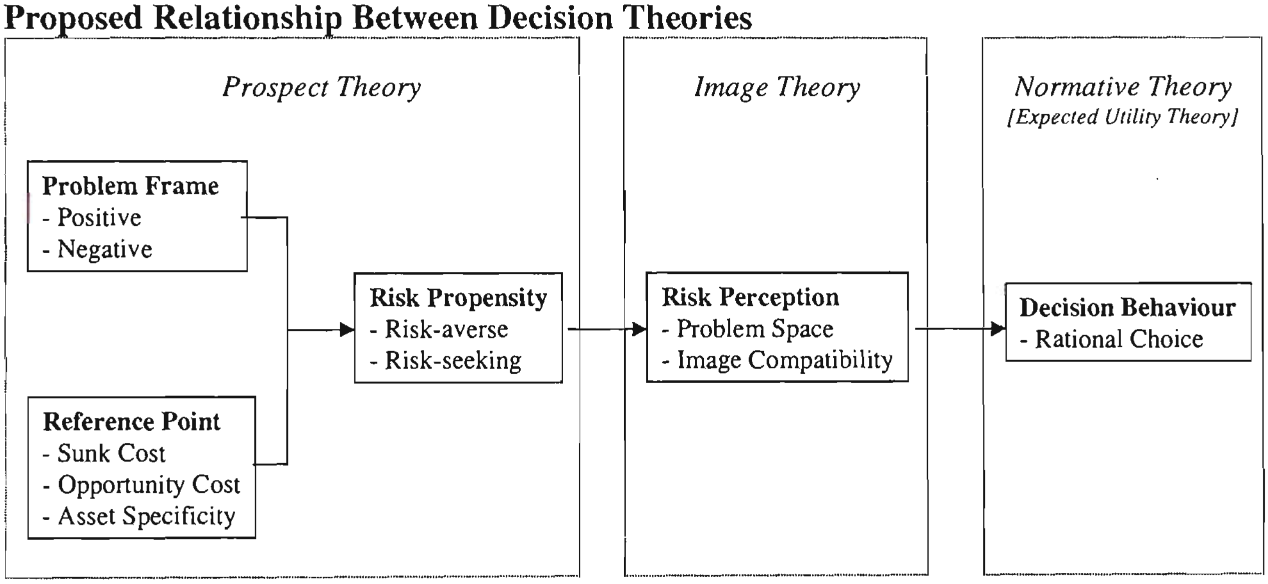


Source: (Adapted from Libby & Lewis, 1977; 1982)

The second stage of the development of the theoretical research model conceptualised the relationship between theories from which variables were derived. The theories were discussed in the literature reviews of Chapter 2 and Chapter 3. There were three steps involved in this stage. First, prospect theory was adopted to provide a basis for

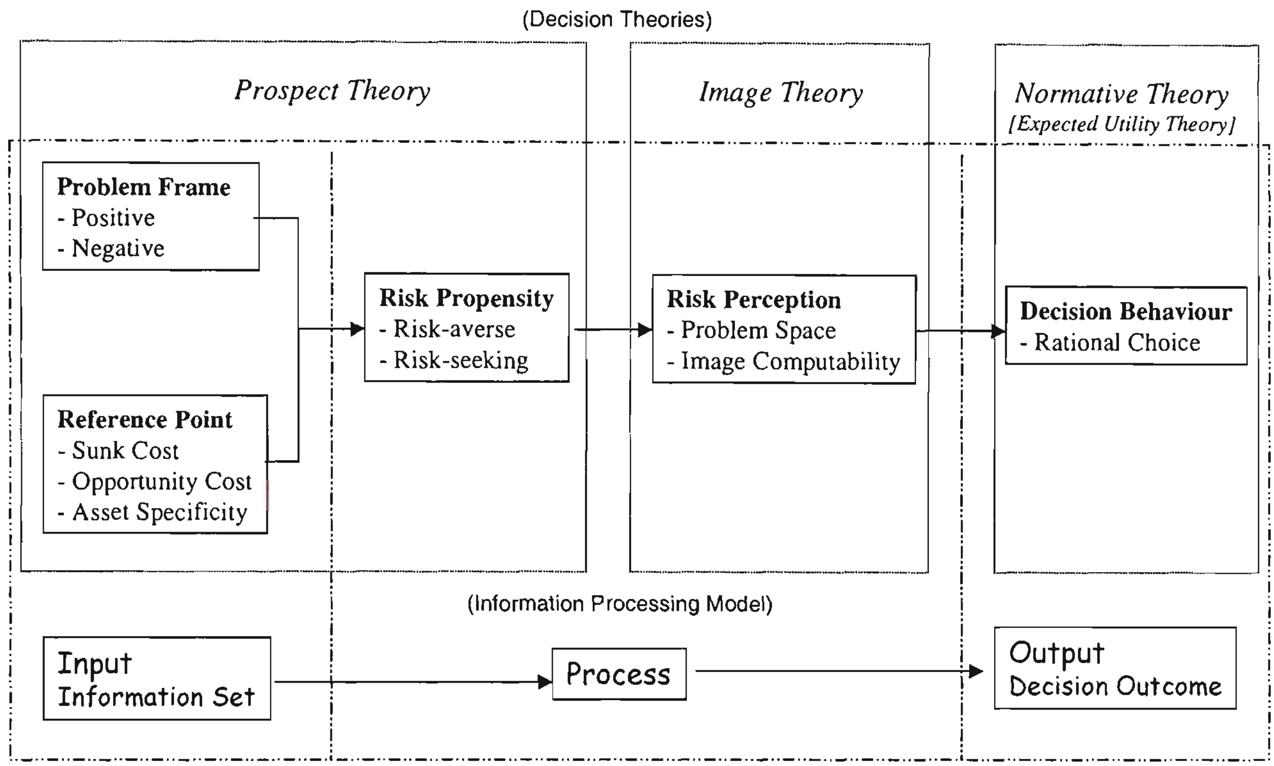
interpretation of the information set. The problem frame and reference point formed the basis for manipulating the task and predicting the risk propensity for a particular task. Second, image theory was adopted to explain the mental image or perception of the risk associated with the task. Image theory posits that perception can be measured in terms of problem space and image compatibility. Finally, expected utility theory was used to predict the optimal choice for a particular task. Expected utility theory posits that the rational decision is the optimal choice. The relationship between the decision theories is represented in Figure 4.5.

Figure 4.5
Proposed Relationship Between Decision Theories



When the simple information processing model was overlaid with the model of the behavioural theories (prospect theory and image theory) and the normative theory of rational choice (expected utility theory) a theoretical research model (Figure 4.6) was produced.

Figure 4.6
Theoretical Research Model



The model developed in Figure 4.6 provides for the examination of variables not considered in prior research. Specifically, the theoretical research model proposed in this thesis provides a better framework to conceptualise the relationship between the input or *information set* (in prospect theory this is the problem frame and reference point) the *process* (in prospect theory is the risk propensity and in image theory the risk perception) and the output or *decision outcome* (in expected utility theory this is the optimal choice). This model met the research objective, which was to test the ability of decision makers to distinguish between relevant and irrelevant information (the sunk cost effect) as well as measure the influence of the manipulation of information (the framing effect) on the decision outcomes. This model applied to the survey results was a means for testing the use of information— manipulated through the inclusion of sunk cost information and framing— with the interplay of various intervening and moderating variables, where the decision outcome was determined according to the optimal decision outcome.

Instrument Testing

On a broad level, survey research is carried out in a systematic and programmatic manner (Hunter, Schmidt & Jackson, 1983; Flynn et al., 1990). Careful pre-testing of instruments in the field serves as a reality check, indicating to the researcher how well conceptualisations of the problem match the actual experience of the practitioner. Careful adherence to such standards prevents survey research studies from becoming isolated and the field from becoming fragmented— that is, without a cumulative tradition of prior work that is essential for knowledge building.

Campbell and Stanley (1963) and Cook and Campbell (1979) recommended that a process of pre-testing be employed to avoid a poorly constructed questionnaire, containing questions that were likely to be left unanswered or that would produce inappropriate and unusable responses. Cooper and Emory (1995) recommended the use of two or more pre-tests and revisions to eliminate biased and ambiguous words and questions, before putting the questionnaire into its final form. This procedure is also endorsed by Kerlinger (1986) and Fowler (1993, 1995). To avoid a possible threat to internal validity, the instruments used were derived from previously published research and subjected to pre-testing and minor revision.

The instrument used in Survey 1, pertaining to private and public hospitals, was administered to a small number of experts in the specific industry/sector. Two accountants, one from a private hospital the other from a public hospital, and three management level staff, one from a private hospital and the other two from a public hospital, tested the instrument. The purpose of the pre-test was to determine adequacy and clarity as well as relevance to the sector, particularly terminology or jargon. The pre-test did not involve a manipulation of independent variables. A minor amendment was made, the particulars are discussed in Chapter 5.

The instrument used in Survey 2, pertaining to financial planners (investment managers), was almost identical in content to the task used for Survey 3. The changes did not alter the financial data, only the nature of the position of the person making the decision to bring the task in line with the role of an "investment manager". Details of the issues and discussion of the minor modifications are presented in Chapter 6.

The instrument used in Survey 3, pertaining to accountants in public practice, was administered to 32 undergraduate students who were final year accounting majors. Their comments and suggestions identified issues for consideration pertaining to the wording and task details. As a result, further advice was also sought from the leading author of the original study. This pre-test did involve the manipulation of the independent variables. Details of the issues and communication with the leading author are presented in Chapter 7.

Litwin (1995) suggested a number of activities to check survey instruments. The activities adopted to check the survey instruments in the various stages of the research project are summarised in Table 4.4 as they apply to the three surveys.

Table 4.4
Check List for Initial Survey Tests

Activity	*Survey 1*	*Survey 2*	*Survey 3*
Check for typographical errors.	A visual inspection was conducted and checked by a third party for any errors.	A visual inspection was conducted and checked by a third party for any errors.	A visual inspection was conducted and checked by a third party for any errors.
Check spelling.	The instruments were prepared on MSWord and the spell checker was used to check for errors.	The instruments were prepared on MSWord and the spell checker was used to check for errors.	The instruments were prepared on MSWord and the spell checker was used to check for errors.
Check that item numbers make sense	Due to the nature of the instruments item numbers were not used.	Due to the nature of the instruments item numbers were not used.	Due to the nature of the instruments item numbers were not used.
Check vocabulary or jargon is appropriate for respondents.	The vocabulary and jargon was relevant to the particular target group.	The vocabulary and jargon was relevant to the particular target group.	The vocabulary and jargon was relevant to the particular target group.
Check the length of the survey	The survey instruments were kept to one page by utilising the full capacity of the A4 paper size.	The survey instruments were kept to one page by utilising the full capacity of the A4 paper size.	The survey instruments were kept to one page by utilising the full capacity of the A4 paper size.
Check the degree of difficulty of the questions.	The questions were specific to the research question and were subject to pre-testing.	The questions were specific to the research question and were subject to pre-testing.	The questions were specific to the research question and were subject to pre-testing.
Check the format of the questions.	The nature of the questions were specific to the research issues and followed an appropriate sequence.	The nature of the questions were specific to the research issues and followed an appropriate sequence.	The nature of the questions were specific to the research issues and followed an appropriate sequence.

Source: adapted from Litwin (1995)

Conduct of the Surveys

A structured program was implemented to conduct the survey in this research to maintain control over the survey process as recommended by Alreck and Settle (1985).

Sample Selection

The subjects for the three surveys were selected from the Australian Yellow Pages, Telephone CD Rom 1999 edition. A full explanation of the procedures followed in each survey is provided in the relevant chapter.

A criticism against the use of phone directories to select samples is that not every person may have a phone or that not every person may be listed; for example, unlisted phone numbers are not available for reasons of privacy (Berdie, Anderson & Niebuhr, 1986, 10; Nachmius & Nachmius, 1976, 108). However, with regard to the hospitals, accountants and financial planners, the nature of their business is such that not being listed in the phone directory is highly unlikely.

Control of Sampling Bias and Error

Sampling bias can result from many sources. One particular trouble with direct mail surveys is inadequate sample size (Fink, 1995d). Mail surveys with response rates of less than 40-50% are not uncommon (Kerlinger, 1986; Cooper & Emory, 1995). Parten (1950, 400) noted that *"most mail questionnaires bring so few returns...that the findings of such surveys are almost invariably open to question."* While it is desirable to have a high response rate, response rates less than 20% are generally considered undesirable (Yu & Cooper, 1983). Nachmias and Nachmias (1976, 107) argued a response rate of between 20% to 40% would be acceptable for analysis of most research questions.

By selecting the person(s) most knowledgeable about the construct of interest and directing the survey to that person the possibility of sampling error is reduced (Huber & Power, 1985). Steps taken to address the potential for sampling error in the form of attribute questions are presented in Table 4.5 which constitutes the check list relevant to this study.

Table 4.5
Check List for Sampling Error

Item	*Survey 1*	*Survey 2*	*Survey 3*
Was the unit of analysis clearly defined for the study?	Yes	Yes	Yes
Does the instrumentation consistently reflect that unit of analysis?	Yes	Yes	Yes
Are the respondent(s) appropriate for the research question?	Yes	Yes	Yes

Enhancing Response to the Surveys

Practical methods used to increase response rates are preliminary notification prior to sending out the survey and follow-ups and reminders after the initial survey is sent (Fox, Robinson & Boardley, 1998); including a stamped self-addressed envelope for returning the questionnaire (Cooper & Emory, 1995); enclosing monetary incentives with the survey (Yu and Cooper, 1983) and contacting non-respondents by telephone and requesting that they complete the questionnaire or encouraging them to answer the survey while on the telephone (Fox, Robinson & Boardley, 1998). Although these procedures tend to increase response rates, none of them alone has been found to consistently improve them (Cooper & Emory, 1995). Bourque and Fielder (1995) recommended the adoption of specific procedures in the conduct of surveys to motivate respondents to reply. These suggestions formed the basis of the check list presented in Table 4.6 and were used in the preparation of the correspondence pertaining to each survey.

Table 4.6
Check List for Motivating Responses

Activity	*Survey 1*	*Survey 2*	*Survey 3*
Explain the purpose of the survey.	The purpose and importance of the survey was addressed in the initial letter.	The purpose and importance of the survey was addressed in the initial letter.	The purpose and importance of the survey was addressed in the initial letter.
Describe who is sponsoring the survey.	There was no actual sponsor for the survey.	There was no actual sponsor for the survey.	There was no actual sponsor for the survey.
Use a letterhead.	Letterheads were used.	A letterhead was used.	A letterhead was used.
Date the letter to be consistent with the actual date of mailing.	Letters were post dated when printed to allow for processing.	Letters were post dated when printed to allow for processing.	Letters were post dated when printed to allow for processing.
Provide a name and phone number for the respondent to contact for further information.	Name, phone, fax & email details were provided.	Name, phone, fax & email details were provided.	Name, phone, fax & email details were provided.
Personalise the salutation, if feasible.	Not possible due to the nature of the database.	Where the first name was available the letter was personalised.	Where the first name was available the letter was personalised.
Explain how respondents were chosen and why their participation is important.	A brief explanation was provided.	A brief explanation was provided.	A brief explanation was provided.
Explain when and how to return the questionnaire.	Instructions and return envelopes were provided.	Instructions and return envelopes were provided.	Instructions and return envelopes were provided.
Provide a realistic estimate of the time required to complete the questionnaire.	A realistic estimate of the time to complete was gained from pre-testing.	A realistic estimate of the time to complete was gained from pre-testing.	A realistic estimate of the time to complete was gained from pre-testing.
Explain how confidentiality and anonymity of respondents' will be protected.	Anonymity and confidentiality was assured from the nature of the data.	Anonymity and confidentiality was assured from the nature of the data.	Anonymity and confidentiality was assured from the nature of the data.
Determine and state a deadline date for return of the questionnaire.	A return deadline was stated to encourage return before a follow-up.	A return deadline was stated to encourage return before a follow-up.	A return deadline was stated to encourage return before a follow-up.

Source: (Adapted from Bourque & Fielder, 1995)

Follow-up Procedures

Bourque and Fielder (1995) also recommended a guide for researchers to use as follow-up procedures for mail surveys. The guidelines are presented in Table 4.7, together with details of how these follow-up procedures were employed in each survey.

Table 4.7
Follow-up Procedure Guidelines

Activity	*Survey 1*	*Survey 2*	*Survey 3*
Ten days after original mailing, send follow-up.	Follow-up was sent 10 days after initial mailing.	Follow-up was sent 14 days after initial mailing.	Follow-up was sent 14 days after initial mailing.
Follow-up can be a post card, letter, telephone call, facsimile, or email.	A short reminder letter was used.	A short reminder letter was used.	A short reminder letter was used.
Send a further questionnaire by mail, facsimile or email.	A further questionnaire was sent 10 days after the due date.	A further questionnaire was sent 10 days after the due date. Where possible a fax was sent.	A further questionnaire was sent 10 days after the due date. Where possible a fax was sent.
Follow-up message should stress the importance and purpose of study.	The issue of relevance to the particular industry was stressed.	The issue of relevance to the particular industry was stressed.	The issue of relevance to the particular industry was stressed.
Reconfirm name and telephone number for contact should information be required.	Name, phone, fax and email were included in the follow-up correspondence.	Name, phone, fax and email were included in the follow-up correspondence.	Name, phone, fax and email were included in the follow-up correspondence.
Follow-up in intervals of ten days.	The 10 day interval was used as a basis for all follow-up activity.	The 10 day interval was used as a basis for all follow-up activity.	The 10 day interval was used as a basis for all follow-up activity.
Record rate of return for each follow-up method used.	Returns were recorded as early or late using the due date as the basis.	Returns were recorded as early or late using the due date as the basis.	Returns were recorded as early or late using the due date as the basis.

Source: (Adapted from Bourque & Fielder, 1995)

Response Rates

The response rates for each of the studies exceeded 30%. Table 4.8 presents a summary of the response rates from the three surveys.

Table 4.8
Response Rates for Each Study

Survey	*Total Sample Size*	*Overall Response Rate*	*Characteristics of Early vs Late*	*Characteristics of Respondents vs Non-respondents*
Survey 1	381 (811 pop.)	56.95% (n=217)	No significant difference.	No significant difference.
Survey 2	265 (863 pop.)	32.5% (n=86)	No significant difference.	No significant difference.
Survey 3	600 (2102 pop.)	39.5% (n=237)	No significant difference.	No significant difference.

Reliability of Responses

Fowler (1993) noted that the responses to questionnaires are the product of complex processes, each of which can have profound effects on the precision, accuracy, and credibility of the results. There are various factors that affect the reliability of responses to survey questionnaires (Fink, 1995c); one important factor concerns the person responding to the questionnaire (Churchill, 1992). The answering of the questionnaire by the specific targeted respondent is important, because people in different positions have different opinions on the issues queried by the survey. This is of particular concern with mail surveys because there is no one overseeing that the appropriate person is responding to the questionnaire. Two procedures to control for this problem are:

1. Be specific regarding the target respondent in the cover letter. The covering letter used in Survey 2 and Survey 3 was specifically addressed to the targeted respondent; and
2. Incorporate questions in the survey which attempt to identify if the target respondent was the person completing the questionnaire. The demographic data in Survey 1, Hospital managers, and Survey 2, Financial Planners, provided confirmation that the targeted respondent was the person who completed the survey.

A further issue likely to affect mail surveys concerns how respondents interpret questions. People approach questions from different frames of reference and thus perceive questions differently. When this occurs, they may modify the question to fit their frame of reference or change it so that it makes sense to them (Cooper & Emory, 1995). To avoid this concern a frame of reference was incorporated in the survey. The terminology and task details were specific to the particular field in which the target subjects were familiar and the survey instruments pre-tested.

Non-Response Bias

The issue of non-response is another factor that contributes to sampling bias and results from the fact that the sample may not be truly representative of the entire population due to non-response from certain individuals. Wallace (1954) found that there were some people who consistently responded to mail questionnaires, while others did not. To the degree that the responses of the participants may be different from those who do not participate, the set of responses being gathered may not be representative of the population (Sekaran 1992). Courtis (1989, p. 120) noted that in "*non-response bias the concern is that sampling estimates will lack external validity in that they will not*

accurately represent or describe the perception of the population". To address concerns regarding external validity, Kerlinger (1986) recommended ascertaining details about the non-respondents for comparison with actual respondents. This approach was employed in the study involving hospitals and is more fully discussed in Chapter 5.

Oppenheim (1992) proposed a test for non-response bias that is based on the assumption that late respondents are fairly similar to non-respondents. A simple t-test is used to compare the overall mean answers of late respondents to those of early respondents. In the case of Survey 1 (the hospitals), the nature of the non-respondents' demographic data, as well as organisational profile data, was available and was checked against those who did respond. No significant differences were found. For Survey 2 (the financial planners) a comparison was made based on the demographic data gathered and the organisational profile data. For survey 3 (the accountants), the details were not as readily available and a t-test was used to distinguish if there were differences between early and late responders.

Data Analysis Methods

The nature of the numerical data collected impacts on the selection of the appropriate statistical method and subsequent quantitative analysis of the variables. The data obtained from the survey questionnaires was primarily of two types: nominal data regarding the choice between two options and ordinal data derived from Likert-scale responses to issues concerning the decision. Nominal data is a categorical scale assigned to indicate the presence or absence of the attribute or characteristic under investigation (Argyrous, 1996). Ordinal data not only categorises the data, it also allows for data to be ordered by degree according to measurements the variable (Argyrous, 1996). Interval data is comprised of constant units of measurement in which the differences between any two adjacent points on any part of the scale are equal (Argyrous, 1996). Table 4.9 summarises the characteristics and statistical implications.

Table 4.9
Characteristics and Implications of Data Measurement

Measurement Scale	*Characteristics*	*Statistical Implications*
Nominal data	A scale that measures in terms of names or designations of discrete units or categories.	Can be used for determining the mode, the percentage values, or the chi-square.
Ordinal data	A scale that measures in terms of such values as "more" or "less", "larger" or "smaller", but without specifying the size of the intervals.	Can be used for determining the mode, percentage, chi-square, median, percentile rank, or rank correlation.
Interval data	A scale that measures in terms of equal intervals or degrees of difference but whose zero point, or point of beginning, is arbitrarily established.	Can be used for determining the mode, the mean, the standard deviation, the t-test, the F test, and the product moment correlation.

Source: (Adapted from Leedy, 1997, 33)

With regard to summated ordinal data, de Vas (1991, 314) highlighted a convention that holds ordinal data as being close enough to interval level to justify the use of interval level statistics. The justification for this approach is that (de Vas, 1991, 314):

> *...in most cases the same patterns occur regardless of whether the variable is treated as ordinal or interval. Given this, the argument is that interval-level analysis ought to be used since it opens up a whole range of more powerful and sophisticated techniques that allow us to control more readily for the effect of extraneous variables.*

The appropriate statistical test for analysis of the data depends upon the type of data. Table 4.10 represents the statistical tests applicable to the type of data gathered in the surveys reported in Chapters 5, 6 and 7.

Table 4.10
Test Selection Chart

Form of Data	*Nominal*	*Interval*	*Ordinal*
Two independent samples	Chi-squre test of association; Fisher exact test	t-test for independent samples; Randomization test	Mann-Whitney U test; Wald-Wolfowitz runs test; Median test.
Two related samples	Binomial test; Chi-square test of association	t-test for matched samples; Walsh test; Randomization test	Wilcoxon signed-ranks test; Sign test.
More than two independent samples	Chi-square test of association	Analysis of variance	Kruskal-Wallis; Median test.
More than two related samples	Cochran Q test	Analysis of variance	Friedman test.
Correlation coefficients (descriptive statistics)	Contingency coefficient; Cramer's statistic	Pearson product-moment correlation	Spearman rho; Kendall tau; Kendall coefficient of concordance.

Source: adapted from Reaves (1992)

Further details of the methods used for data analysis using chi-square, ANOVA and multiple regression are outlined in the following three sections.

Chi-Square

Nominal or categorical measurement was used to assign numbers to classify the independent variables (sunk cost and assets specificity) as well as the dependent variable (decision). For example, in the dependent variable the choice to continue with internal production "1" is different from the choice to outsource "2". The method of statistical analysis most commonly recommended for nominal coded data is the chi-square test (Huck, Cormier & Bounds: 1974, 216; Isaac & Michael, 1990, 177; Sproull, 1995, 68).

A limitation arises when a cell frequency in the chi-square test is less than 5. Daniel and Terrell (1975, 292) suggest that there is debate about whether the minimum frequency for a cell should be 1, as supported by Cochran (1952; 1954), or the more conservative general rule that the minimum should be 5. Levin (1984, 439) stated that incorrect inferences may be made if the cell frequency is less than 5 unless correction factors are applied. Argyrous (2000, 410) provided two alternative techniques: Yate's correction for continuity and Fisher's exact probability test. Pett (1997, 156) provided a list of published research which used the Fisher Exact Probability Test to justify conclusions drawn from small cell samples. The statistical measure to overcome small frequencies adopted in this research was the Fisher Exact Probability Test.

Cross-tabulation is the method used to show whether there is a relationship between two variables (Robson, 2000, 331). The assumption is that there is a relationship between two variables and this relationship means that the distribution of scores or values on one of the variables is linked to the distribution of values on the second variable. That is, higher scores on one variable tend to occur when there are higher scores on the second variable (Robson, 2000, 331). The decision rule used for the chi-square test is shown below.

Decision Rule:

Reject the null hypothesis of independence at the level of significance "a" if the value for the sample χ^2 exceeds the value of the critical χ^2 for the same degrees of freedom (Mansfield, 1987, 357; Freund & Williams, 1982, 378).

Critical Assumptions of χ^2 for Two Independent Samples:

1. The data being analysed must be frequency data, not scores.
2. The variables being examined are categorical, with mutually exclusive levels.
3. The observations must be independent of one another.
4. If the two variables being examined are dichotomous, resulting in a 2 x 2 contingency table with df = 1, all expected frequencies for the table should be 5. For larger tables where df >1, no more than 20% of the cells should have expected frequencies of less than 5. [*Note*: this assumption is challenged in the literature and may be relaxed to an expected frequency of 1 (Pett, 1997, 159)].

The χ^2 statistic and its "p" value resulting from a test provide little information concerning the strength of the association between the two variables being examined (Pett, 1997). A further limitation of the test is that the χ^2 values cannot be compared across studies of different sizes because the size of the statistic is directly influenced by the size of the sample. Several commonly used measures of association that are generated from the chi-square statistic provide information concerning the strength of the association between two categorical variables, for example, the phi coefficient, the contingency coefficient, and Cramer's *V*.

The phi coefficient can be used to determine the strength of association between the two variables (Pett, 1997). The values for the phi coefficient range between 0 and 1.00 for a 2 x 2 table, with 0 indicating no relationship and 1.00 indicating a perfect relationship. For interpretative purposes, the strength of the relationship can be assessed according to the following ranges:

- 0 to .49 suggest a weak or low strength relationship;
- .50 to .69 is a relationship of moderate strength;
- .70 to .89 indicates a strong relationship; and
- .90 to 1.00 suggests a very strong relationship.

When one dimension of the table is greater than 2 (that is, a 2 x k table), the value of the phi coefficient may not lie between 0 and 1 because the value can be greater than the sample size. The alternative statistic is the contingency coefficient, because the value of this statistic will always lie between 1 and 0. However, because its value depends on the number of rows and columns in the table, it will never attain the upper limit of 1 (Pett, 1997). To address this problem, a variant of the contingency coefficient, Cramer's V, is preferred because Cramer's V will always range between 0 and 1. For a 2 x 2 table Cramer's V will have the same value as the phi coefficient (Pett, 1997).

Critical Assumptions of the Fisher Exact Probability Test:

1. Both independent and dependent variables are dichotomous, with two mutually exclusive categories.
2. The data to be analysed are obtained from a random sample and represent frequencies, not scores.
3. Because this is an exact test of probability, it is necessary to know the number of cases in the marginals before the data are analysed (Pett, 1997, 151).

ANOVA

The statistical method used to test the null hypothesis that the means of several populations are equal is called the ANOVA (one-way analysis of variance). ANOVA uses a single factor, fixed effects model to compare the effects of one factor on a continuous dependent variable. Unlike the t-test, which uses sample standard deviations, ANOVA uses squared deviations or the variance so that computation of distances of the individual data points from their own mean or from the grand mean can be summed. Between-groups variance represents the effect of the treatment or factor. The within-groups variance describes the deviations of the data points within each group from the sample mean, also referred to as error (Emory & Cooper, 1991, 547).

Decision Rule for ANOVA:

One way analysis of variance ~ Reject the null hypothesis that the population means are all equal if the ratio of the between-group mean square to the within-group mean square exceeds $F\alpha$, where α is the desired significance level (Mansfield, 1987, 408).

If there is a significant overall difference between the groups, there are various additional statistics that can help to pinpoint which of the differences between particular pairs of means are contributing to this overall difference. The alternative ways of assessing significance level when a sequence of similar tests are carried out on a data set are the Fisher PLSD test, the Scheffe F-test and the Dunnett t-test. The Scheffe test is considered the most stringent criteria for significance (Robson, 2000, 356).

Underlying Assumptions of ANOVA:

1. The contribution to variance in the total sample must be additive.
2. The observations within sets must be mutually independent.
3. The variances within experimentally homogenous sets must be approximately equal.
4. The variations within experimentally homogenous sets should be from normally distributed populations (Isaac & Michael, 1990, 183).

Multiple Regression

Multiple regression is used in much the same way as linear regression. That is, it is used to provide a line of best fit and predictions through substitutions of different values of x1 and x2. However, its main use is to provide an estimate of the relative importance of the different independent variables in producing changes in the dependent variable (Robson, 2000).

Key Elements of Multiple Regression:

R-squared is the multiple coefficient of determination, and measures the proportion of the variance in the dependent variable which is explained by the dependent variables in the equation (Robson, 2000, 347).

The t-value of coefficients is a test to determine whether or not the associated beta coefficient is significantly different from zero. The standard error of coefficients is a measure of the accuracy of the individual regression coefficients (90% and 95%) and is useful in assessing the likely accuracy of predictions based on the regression equation (Robson, 2000, 347).

Decision Rule for Multiple Regression:

> Reject the null hypothesis that the true regression coefficients are all zero if the ratio of the explained mean square to the unexplained mean square exceeds $F\alpha$, where α is the desired significance level (Mansfield, 1987, 508).

In bivariate linear regression, t and F tests produce the same result since t^2 is equal to F. In multiple regression, the F test has an overall role in the model, and each of the independent variables is evaluated with a separate t test (Emory & Cooper, 1991, 605).

Construct Analysis

The following tables bring the research issues together and present the constructs used in each of the survey tasks identifying the category of variable and the data measurement scale. Table 4.11 identifies the constructs, and the categories of the data gathered in regards to the outsourcing task of Survey 1.

Table 4.11
Summary of Outsourcing Task ~ Survey 1 (Hospitals)

Variable Category	*Construct*	*Scale*
Treatment Effect: (Treatment Variables)	Framing Sunk cost Asset Specificity	Nominal Nominal Nominal
Demographic Variables: (Independent Variables) [Predictors]	Private vs Public Job position Years of experience Age Gender Size of hospital Previous considered If 'yes' outsourcing 'yes/no'	Nominal Interval / Ordinal Interval / Ordinal Interval / Ordinal Nominal Interval / Ordinal Nominal Nominal
Dependent Variables: (Criterion Variables)	Choice – Internal /Outsource	Nominal

Table 4.12 identifies the constructs, and the categories of the data gathered in the investment task of Survey 2.

Table 4.12
Summary of Investment Task ~ Survey 2 (Financial Planners)

Variable Category	*Number*	*Scale*
Treatment Effect: (Treatment Variables)	Framing Sunk cost Information	Nominal Nominal Nominal
Demographic Variables: (Independent Variables) [Predictors]	Problem space inventory Image compatibility	Interval / Ordinal Interval / Ordinal
Dependent Variables: (Criterion Variables)	Choice - level of funds	Nominal

Table 4.13 identifies the constructs and the categories of the data gathered in the outsourcing task of Survey 3.

Table 4.13
Summary of Outsourcing Task ~ Survey 3 (Accountants)

Variable Category	*Construct*	*Scale*
Treatment Effect: (Treatment Variables)	Framing Sunk cost Asset Specificity	Nominal Nominal Nominal
Demographic Variables: (Independent Variables) [Predictors]	Attitude to Outsourcing Certainty of Decision Rational vs Intuitive style	Interval / Ordinal Interval / Ordinal Interval / Ordinal
Dependent Variables: (Criterion Variables)	Choice – Internal /Outsource	Nominal

Table 4.14 identifies the constructs, and the categories of the data gathered in the investment task of Survey 3.

Table 4.14
Summary of Investment Task ~ Survey 3 (Accountants)

Variable Category	*Number*	*Scale*
Treatment Effect: (Treatment Variables)	Framing Sunk cost Information	Nominal Nominal Nominal
Demographic Variables: (Independent Variables) [Predictors]	Problem space inventory	Interval / Ordinal
Dependent Variables: (Criterion Variables)	Choice - level of funds	Nominal

Tables 4.11 to 4.14 provided a conceptual overview of the structure employed in the approach to analysing the data gathered by the three surveys. The statistical analysis and the results are reported in the following Chapters 5, 6 and 7.

Chapter Summary

This thesis involved the design and application of three separate surveys concerned with the sunk cost phenomenon. The sampling techniques used to select subjects were based on a stratified random sampling approach. The suggested methods for improving reliability and validity in the survey instruments as well as reducing bias and non-response bias in the conducting of survey research were identified.

The research methods employed in the individual surveys are quantitative and involved testing of statistical relevance. Appropriate statistical measures were selected according to the classification of the data gathered. The basis for the statistical analysis were derived from the overview presented in Tables 4.9 to 4.14 within this Chapter. The results of the analysis of the survey data are presented in Chapters 5, 6 and 7.

Due to the nature of the multiple survey approach, triangulation was considered as a method for furthering the discussion when making comparisons of the results. These conclusions are presented in Chapter 8.

CHAPTER 5

The Role of Asset Specificity and Sunk Cost Information on Outsourcing Decisions: A Survey of Australian Public and Private Hospitals

Chapter Abstract

This survey explored the effect of asset specificity and sunk cost information on decisions to outsource production made by managers in public and private hospitals in Australia. Outsourcing decisions involve a choice between internal production and external supply; this is similar to the task commonly known as "make or buy" in the management accounting discipline. Normative models of management accounting posit that only future costs that differ between the decision alternatives should be considered, while factors such as past experience and past (sunk) costs should not enter into the decision process.

The results of the survey suggested that decision makers are influenced by asset specific and sunk cost information. Sunk cost information influenced the decision both through its presence and also by the level. However, they were not influenced by years of experience, past experience with outsourcing, nor where there gender differences in the decisions made to outsource. In addition, neither the type of hospital (public or private) or the size of the hospital had any bearing on the manager's decision to outsource.

Background to the Research

The health care sector plays an important role in the Australian economy. For the financial period 2000-2001, funding provided under the Australian Health Care Agreements was $6.3b (ABS, 2002). The costs associated with the health sector have been steadily growing for decades and the availability of quality health services is a topic issue in the early 21st century.

Table 5.1 Comparison of Public and Private Hospitals Revenue and Recurrent Expenditure for 1999-2000

	Public	*Private*	*Total*	*Private Hospitals as a percentage of total*
	$m	$m	$m	%
Revenue	1,223	4,204	5,427	77.5
Recurrent expenditure	14,350	3,957	18,307	21.6

(Source: ABS, 2002)

A comparison between private and public hospitals of revenue generated and recurrent expenditure for the 1999-2000 period reveals that private hospitals generated higher revenues while operating with lower recurrent expenditure (Table 5.1), indicating that private hospitals were better able to capture cost savings than public hospitals. One proposed method of costs savings is the decision to outsource various operational functions.

Cost Saving and Outsourcing

Powell (1997) demonstrated that outsourcing operational functions is a growing phenomenon. Developing an appropriate outsourcing strategy is essential for the long-term profitability of any organisation (Park, Reddy & Sarkar, 2000). Outsourcing is becoming a common practice in both the public and private sector world-wide (Hensley, 1997; Chin, 1997; Hurley & Schaumann, 1997; Vining & Globerman, 1999; Quinn, 2000). Fill and Visser (2000) documented that firms were contracting out a growing number of central business activities, such as payroll, accounting, catering and information technology during the past decade.

Prior research revealed that cost efficiency was the primary reason given by managers for the decision to outsource (Fill & Visser, 2000, 44). However, Chalos (1995) found that many companies reported an increase in costs rather than a decrease in costs as a result of outsourcing. A strategic model proposed by McIvor, Humphries and McAleer (1997) adopted a "make or buy" approach to evaluate outsourcing decisions. Built into this model was emphasis on the strategic issues confronting management such as maintaining control over core activities within the business, benchmarking by looking beyond products to the operating and management skills required, and identifying as well as measuring all the actual and potential costs involved in outsourcing the activity.

Outsourcing in Hospitals

Outsourcing in Private Hospitals

Outsourcing in the healthcare sector is increasing in frequency in the United States of America (Hensley, 1997; Chin, 1997). Research has shown that the main reason for outsourcing by hospitals is cost cutting (Hensley, 1997; Luevanos, 1997). The common services outsourced are support services such as housekeeping, provision of meals, laundry, computer systems, and account collection (Kee & Matherly, 1996; Coles & Hesterly, 1998). However, Kee and Matherly (1996) found that in addition to managing costs, hospital managers also cited improvement of quality and more efficient delivery of services as important reasons for choosing to outsource.

Outsourcing in the Australian Public Sector

In Australia, the public hospitals are the responsibility of the relevant State Government and yet the majority of funding is derived either directly or indirectly from the Federal Government. Initiatives over the last ten years in the Australian public sector, at both Federal and State levels, were aimed at privatisation or corporatisation of public organisations to improve financial effectiveness. Suggested changes included "targeting budgeting" which provided rolling three year expenditure ceilings for forward financial planning, and "global budgeting" which allowed discretion in the use of funds otherwise allocated for a specific project (Nicholls, 1991). These budgetary changes imposed responsibility on individual managers for their actions.

These initiatives later flowed through to the administration of public hospitals throughout Australia (Harris, 1999; Chua, 1995). Managers are no longer constrained by just the fiduciary requirements of the authority, the budgeting process allows involvement at various levels of management, in particular middle management (Forster, Graham & Wanna, 1996). Managers in public hospitals are expected to adopt private business values and their associated behaviours (Currie, 1996). As a result of the expected changes to managerial operations within the public sector, the decision to outsource by management in public hospitals could be expected to be no different to that of the private hospitals.

Indications are that outsourcing is an important topic for research into decision making for management accountants. Private ands public hospitals in Australia were selected for Survey 1 because that they represent a sector in which management accountability is affected by government attempts to introduce greater levels of self sufficiency, therefore managers are more likely to assume accountability for profitable operations (Broadbent & Guthrie, 1992; Chua, 1995; Funnell & Cooper, 1998; Harris, 1999).

Outsourcing Decisions in Management Accounting

The management accounting literature follows the norms of economic theory pertaining to rational decision making. Normative economic theory posits that efficient firms allocate their resources to the activities in which they have a comparative advantage over their competitors (Shank & Govidajaran, 1992). In simple terms, a firm acting in an economic rational manner should concentrate on its primary business activity to the exclusion of all others. Managers need to be acutely aware of the difference between relevant and irrelevant costs when making outsourcing decisions. From the perspective of management accounting, relevant costs are defined as "*those costs that are pertinent to or logically associated with a specific problem or decision and that differ between alternatives*" (Raiborn, Barfield & Kinney, 1999, 242). In essence, cost information is relevant when it logically relates to a decision concerning possible future activities.

These principles set the parameters for analysing financial information when managers are choosing between alternative courses of action, in particular whether to "make or buy" (Horngren, Foster & Datar, 2000). Any decision in which a manager must decide on behalf of the firm whether to meet its needs internally or to acquire the goods or services externally is a make-or-buy decision. According to management accounting text books, these decisions are concerned with choice of the best use of available resources or facilities (Hansen & Mowen, 2000, 692). The main question of the make or buy decision is framed in terms of *"What is the difference in relevant costs between the alternatives?"* (Horngren, Foster & Datar, 2000, 385).

Relevant Costs

Hansen and Mowen (2000, 687) suggested that *"...to be relevant, a cost must not only be a future cost but must also differ from one alternative to another."* Accordingly,

relevant costs must be future expected costs and must differ between alternative decisions or courses of action. Including opportunity costs in the decision process may reduce the number of alternatives. Opportunity costs represent benefits that are generally not recorded in the accounting system because they have not yet occurred nor can they be accrued (Horngren, Foster & Datar, 2000, 389). If limited resources are used for a particular purpose, the maximum available contribution to profit is forgone. The method frequently used to analyse opportunity costs across alternative choices is "differential analysis" which determines the net income contributed by each alternative.

Differential analysis compares the incremental revenues and costs of alternative decisions. Differential refers to the difference between the choices and incremental refers to the additional or extra amount associated with each alternative. Therefore incremental revenue is the additional revenue resulting from a particular course of action and incremental cost is the additional cost of that particular course of action. Differential costs and incremental costs are the relevant costs in financial decision making (Raiborn, Barfield & Kinney, 1999, 242; Horngren, Foster & Datar, 2000, 386).

Irrelevant Costs

Past costs that are unavoidable are deemed irrelevant to outsourcing decisions because they can not be changed (Horngren, Foster & Datar, 2000, 379). In a make or buy analysis, past investments are irrelevant and are referred to as "sunk costs". The sunk cost of an asset is not necessarily the present book value of a depreciable asset but rather the unrecoverable portion of the asset's book value. This is determined by subtracting the asset's current resale value from its present book value. The amount which could be realised on the disposal of the asset is a cost of keeping this asset in operation. If the decision is to keep the asset in operation, the opportunity to invest the resale value is foregone.

Despite the prescription to ignore sunk cost information, evidence is mounting that there is a "sunk cost effect" where managers include these costs in the process of making the decision (Arkes & Bulmer, 1985).. Staw (1976) and Whyte (1991) found that sunk cost behaviour was more likely to occur when the decision maker felt personally responsible for negative consequences as a result of the original decision. Therefore, even though

sunk costs are irrelevant from an accounting perspective, the decision maker (regardless of experience) is likely to be influenced by the knowledge that sunk costs exist.

Asset Specificity

An alternative approach to outsourcing analysis, focused on asset specificity, is found in transaction cost economics where the limitations posed by the specific nature of the assets impacts on decision making. Williamson (1985) argued that asset specificity is a critical dimension for describing transactions between parties when investment in new or additional equipment was required. Investment in non-standard items of equipment limits flexibility and increases risk (Williamson, 1985; 1986). Under transaction cost economics, outsourcing issues are considered in light of costs associated with asset specific investments, including monitoring external suppliers if the decision is made to buy Chalos, 1995). Research into outsourcing from the transaction cost perspective is limited. The hospital industry provides a setting in which both physical and human assets are important components of the production process and impact upon the decision to make or buy (Coles & Hesterly, 1998).

Asset specificity may be considered another form of sunk cost— a cost that will become sunk as a result of the present choice. The definition of asset specificity is investment in an asset which is required specifically to allow the outsourcing activity to function, is dedicated to one use only, and can not be modified for any other purpose. Investments that can be used for other purposes are not asset specific. The requirement to invest in an asset that is specifically used for the duration of the outsourcing agreement can be expected to have a negative impact upon the decision to outsource. Whether decision makers are able to identify the relevance of investments that are specific to one purpose is relevant to understanding the sunk cost effect.

Roodhooft & Warlop (1999) introduced asset specificity into the accounting literature with their study of outsourcing decisions by managers in Belgian hospitals. According to the theory of transaction cost economics, the degree of asset specificity is an important consideration in the outsourcing decision. Outsourcing is only desirable when expected governance and coordination costs, which result from asset specific investments, are lower than the production cost advantage of an external supplier

(Chalos, 1995). In other words, not only must there be a production cost saving (advantage) but the cost of doing business with an external supplier must be less than the savings. The cost of doing business is the cost associated with the investment required in assets specifically to enable the interaction with the external supplier. The Belgian study suggested that a similar application to outsourcing decisions in Australian public and private hospitals would be useful.

Manager's Experience

According to Bonner (1994), the individual decision maker's characteristics may be important determinants of performance, suggesting that both the task and the characteristics of the decision maker together impact on the performance of some particular task. Awasthi and Pratt (1990) indicated that an individual's ability to comprehend and apply a decision rule to solve a complex problem might be influenced by level of training and experience in that particular field. McAulay, King and Carr (1998, 174) made the observation from prior research into management decision making that *"experience figures as an important concern in studies of financial expertise"*.

Research Design

In order to examine these issues more closely, it was necessary to develop series of hypotheses and a theoretical model to structure analysis of the variables.

Hypothesis Development

Following on from the literature review, a number of null hypotheses were developed for testing in the survey. Even though sunk costs are irrelevant from an accounting perspective, the decision maker, (regardless of experience) is likely to be influenced by the knowledge that sunk costs exist. This led to the following null hypothesis to be tested in Survey 1.

> H_{o1}: The decision to outsource will not be different because of *the presence* of past investment (sunk costs).

This null hypothesis tests for the existence of the sunk cost effect discussed by Arkes and Bulmer (1985). To further test the sunk cost effect, the second null hypothesis tests whether a difference in the amount of the sunk cost will influence the decision to outsource.

H_{02}: The decision to outsource will not be different because of *the level* of past investment (sunk cost).

Two hypotheses were developed to test for differences between private and public hospitals and the size of the hospital.

H_{03}: The decision to outsource *will not differ* between private and public hospitals.

H_{04}: The decision to outsource will not differ between hospitals of different size.

The effect of asset specificity was tested by the following hypothesis:

H_{05}: The decision to outsource will not be lower when asset specific information is present in the scenario.

The final set of hypotheses tested the effects of the manager's experience in the areas of years of experience, previous experience with outsourcing decisions and the effect of gender.

H_{06} The decision to outsource will not differ between respondents with different years of experience.

H_{07}: The decision to outsource will not differ between decision makers who have previously considered outsourcing.

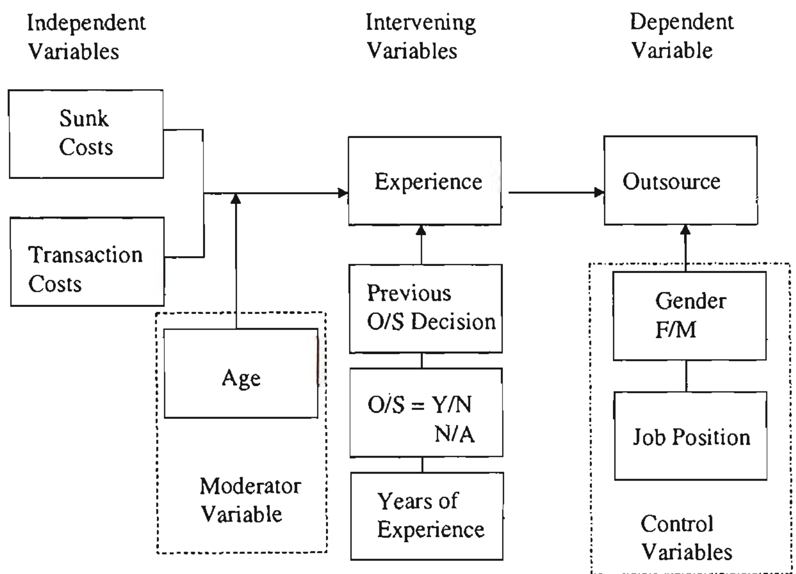
H_{08}: The decision to outsource will not differ between respondents of different gender.

These null hypotheses address possible differences in the decision to outsource as a result of various demographic details that have been identified in this research as moderating, intervening and control variables. An overview of the relationships between the variables in Survey 1 is represented in Figure 5.1 in the next section.

Relationships Between the Variables for Testing

This research explored the relationship between a number of variables. The major variables of concern in the research were the independent variables (sunk costs and transaction costs) and the dependent variable (the decision to outsource). The model presented in Figure 5.1 was used to structure the research and is derived from the theoretical model presented in Chapter 4.

Figure 5.1
Overview of Variables in the Research Study



Survey Instruments

There were six versions of the survey instrument, each with a task that differed in details regarding sunk cost, opportunity cost and asset specific information. The versions were based on Roodhooft and Warlop (1999), with a number of modifications to suit the Australian environment and accommodate improvements suggested in the literature. In particular, clarity of instructions, manipulation of the degree of difference in monetary amounts and more specific indication of the time value of money were addressed.

Two additional versions were created to test the effect of low levels of sunk cost and asset specificity. The comparison between the financial data was improved by the use of net present values with regard to future cash flows. The advantages and disadvantages of relying on external suppliers included cost comparisons and factors not easily quantifiable, such as dependability of suppliers and quality of service or goods. To minimise the effect of non-financial factors, the instructions in the letter and in the wording of the scenario explicitly asked the subjects to consider *only* financial information in order to reach their decision.

Pilot-Testing the Instrument Versions

The instrument was pretested by administering the questionnaires to a small number of experts in the sector: two accountants (one from a private hospital, the other from a

public hospital) and three management level staff (one from a private hospital and the other two from a public hospital). The purpose of the pretest was to determine adequacy and clarity as well as relevance to the sector, particularly terminology or jargon. The pretest did not involve the manipulation of the independent variables.

Data Collection

Target Population and Sample Construction

A list of all public and private hospitals in Australia was obtained from the Australian Yellow Pages Telephone CD Rom 1999 edition. A number of stages were involved in developing the database. First, surgeries and clinics were deleted, leaving a total population of 833 hospitals. This was done in the belief that the outsourcing issues presented in the survey instruments would not be relevant to the operations of such organisations. Second, the remaining hospitals were categorised as either public or private, with 270 identified as private and 563 as public. This categorisation was considered necessary to provide for analysis of results. Third, each group was sorted into state order to avoid bias in allocation of instruments. Following the initial mail out, surveys from 12 public and 10 private were returned with the notification that the particular hospital was closed. This reduced the total population to 811.

When the actual population is known, the statistical method to determine the appropriate sample size can be employed. The appropriate sample size for the two populations were: public N=550, s= 226 and private N = 260, s = 155 (Leedy, 1997, 211). The response rates were 56.64% for public hospitals (128) and 57.42% for private hospitals (89). Issues concerning sample error were considered in the preparation stage through the process of sample selection described in Chapter 4.

Questionnaire – Mail Survey

A survey questionnaire was mailed to the sample of private and public hospitals throughout Australia. The survey instrument was based on prior research and modified to satisfy suggestions for improvement from prior research and to clarify the financial focus by use of net present values. The instrument was kept to one page to keep the survey task to a minimum amount of time for respondents to complete and the administrative procedures adopted from Frazer and Lawley (2000, 79).

Control for Non-Response Bias

To assess the potential non-response bias, two approaches were used to determine whether responses from non-respondents would have been significantly different from the data collected. Both approaches compared the association between (a) responses from early and late respondents and (b) known characteristics of both respondents and non-respondents. The likelihood of non-response bias was assessed using late responses as a proxy for non-responses. A comparison of the variables provided little difference between early and late respondents. The chi-square for early/late responses for public hospitals was χ^2 1.187 with df=1 (Table 5.2). The chi-square for early/late responses for private hospitals was χ^2 0.953 with df=1 (Table 5.3).

Table 5.2
Analysis of Early Late Responses ~ Public Hospitals

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.187[b]	1	.276		
Continuity Correction [a]	.752	1	.386		
Likelihood Ratio	1.169	1	.280		
Fisher's Exact Test				.375	.192
Linear-by-Linear Association	1.177	1	.278		
N of Valid Cases	128				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.55.

Table 5.3
Analysis of Early Late Responses ~ Private Hospitals

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.953[b]	1	.329		
Continuity Correction[a]	.559	1	.455		
Likelihood Ratio	.946	1	.331		
Fisher's Exact Test				.366	.227
Linear-by-Linear Association	.942	1	.332		
N of Valid Cases	89				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.87.

Tests for non-response bias, using the characteristics of size and location were also carried out. The analysis of the association between a firm's response outcome (that is, whether or not the firm responded) and firm characteristics indicated that there were no significant differences between the characteristics of respondents and non-respondents.

Data Analysis

Statistical Methods

Nominal or categorical measurement was used to assign numbers to classify the independent variables (sunk cost and asset specificity) as well as the dependent variable (decision). For example, in the dependent variable the choice to continue with internal production "1" is different from the choice to outsource "2". The method of statistical analysis most commonly recommended for nominal coded data is the chi-square test (Huck, Cormier & Bounds: 1974, 216; Isaac & Michael, 1990, 177; Sproull, 1995, 68). A possible limitation of the testing method is the number of versions used (six in total). Some of the survey responses resulted in a cell frequency in the chi-square test of less than 5.

Daniel and Terrell (1975, 292) suggest that there is some debate about whether the minimum frequency for a cell should be 1, as supported by Cochran (1952, 1954), or the more conservative general rule that the minimum should be 5. Levin (1984, 439) stated that incorrect inferences may be made if the cell frequency is less than 5 unless correction factors are applied. Argyrous (2000, 410) provided two alternative techniques: Yate's correction for continuity and Fisher's Exact Probability Test. Pett (1997, 156) provided a list of published research which used the Fisher Exact Probability Test to justify research findings and conclusions drawn from small samples. The statistical measure adopted to overcome a small frequency in this research was the Fisher Exact Probability Test. The test results are reported for all tests where the cell frequencies were below the minimum of 5.

Validity Issues

Construct validity is concerned with what the instrument is intended to measure (Churchill, 1987, 384). The instruments used in this study were derived from prior

research which provided confirmation that the data does measure the intended constructs. Further discussion on construct validity was undertaken in Chapter 4. Internal validity is concerned with the establishment of causal relationships. The random assignment of subjects provided assurance that all groups were equivalent thereby minimising threats to internal validity (Abernathy et al., 1999, 17). Other checks conducted to improve validity included selection and application of appropriate statistical tests and analysis of early and late responses.

Findings (Analysis & Evaluation)

Eight null hypotheses were generated with regard to the outsourcing decision versions. These hypotheses called for the use of a chi-square test. The results and their interpretation are discussed below. The specific details of the six different versions are summarised in Table 5.2. Based upon conventional management accounting logic, the rational choice in each case is to select the outsourcing option. In each version, the cost to outsource is less than the cost of internal production and as such the economic rational decision is to select the option which costs less. The expected result was for respondents to select the outsource option based purely on the financial data presented.

Table 5.4
Summary of Survey 1 Details

Version	*Make option*	*Outsource (buy) option*
A (pub=22) (prv=20)	Production cost: $3,000,000	Purchase price: $2,600,000 Investment (not asset specific): $300,000
B (pub=23) (prv=14)	Production cost: $3,000,000	Purchase price: $2,600,000 Asset specific investment: $300,000
C (pub=21) (prv=17)	Production cost: $3,000,000 Sunk investment: $1,400,000	Purchase price: $2,600,000 Investment (not asset specific): $300,000
D (pub=22) (prv=13)	Production cost: $3,000,000 Sunk investment: $1,400,000	Purchase price: $2,600,000 Asset specific investment: $300,000
E (pub=22) (prv=12)	Production cost: $3,000,000 Sunk investment: $500,000	Purchase price: $2,000,000 Investment (not asset specific): $300,000
F (pub=18) (prv=13)	Production cost: $3,000,000 Sunk investment: $500,000	Purchase price: $2,000,000 Asset specific investment: $300,000

Details: pub = public hospitals; prv = private hospitals.
N (public hospitals)= 128; N (private hospitals)= 89

The results of the survey were not consistent with the expectations gained from the literature and prior research. Table 5.5 presents the percentage of respondents who selected the option to outsource for each of the six versions. For public hospitals, a majority of respondents selected the outsourcing option only in versions A and E. For private hospitals, a majority of respondents selected the outsourcing option only in version E.

Table 5.5
Percentage of Respondents Selecting the Outsourcing Option

Version	*Public*	*Private*	*R&W(1999)*	*Details*
A	68.2% (15)	60.0%(12)	59.3%	NATC + NSC
B	34.8%(8)	35.7%(5)	40.0%	ATC + NSC
C	23.8%(5)	23.5%(4)	42.9%	NATC + SC
D	13.6%(3)	7.7%(1)	12.0%	ATC + SC
E	54.5%(12)	58.3%(7)	N/A	NATC + SC
F	38.9%(7)	23.1%(3)	N/A	ATC + SC

NATC = No Anticipated Transaction Cost (Not Asset Specific)
ATC = Anticipated Transaction Cost (Asset Specific)
NSC = No Sunk Cost
SC = Sunk Cost

In comparison with the results reported by Roodhooft and Warlop (1999), the public hospitals managers' response to version A appears to be the closest. The responses to versions B, C and D were inconsistent with the expected rational decision-making approach. In other words, the choice not to outsource was sub-optimal and irrational according to the normative theory of rational decision making.

Hypothesis Testing of Sunk Cost

The versions relevant to test hypothesis H_{01} were C, D, E, and F compared to A, and B. The null hypothesis is repeated below.

H_{01}: The decision to outsource will not be different because of *the presence* of past investment (sunk costs).

The results presented in Table 5.4 show that for those versions in which a sunk cost was present (C, D, E, and F), the selection of the outsourcing option was generally less frequent than the corresponding versions, which had no sunk cost.

To test H_{01} a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.6 presents the

results of the 2 x 2 contingency table and Table 5.6a in the Appendix provides details of the chi-square tests.

Table 5.6
Crosstabulation of Outsourcing Decision * Sunk Cost/No Sunk Cost

Sunk Cost	*Outsource*		
	No	Yes	Total
No (AB)	40	41	81
Yes (CDEF)	95	41	136
Total	135	82	217

Result: χ^2 sample = 9.049 (α =0.003, df = 1)
Decision: **Reject the null hypothesis.**
Computed χ^2 exceeds the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

The decision to outsource did systematically differ between versions with sunk costs and those without. The null hypothesis was also rejected when the two types of hospitals were tested independently.

Public Hospitals χ^2 sample = 4.232 (α =0.040, df = 1) **Reject the null hypothesis.**
Private Hospitals χ^2 sample = 5.179 (α =0.023, df = 1) **Reject the null hypothesis**

As this was a vital part of the study, further tests were conducted to examine the relationship between the versions with no sunk cost and those with different levels of sunk cost. Details of the differences between versions were summarised in Table 5.4 and the results of the tests are reproduced in Table 5.7.

Table 5.7
Test of Sunk Cost Effect on the Outsourcing Decision

Version	*Public* χ^2	*Private* χ^2	*Combined* χ^2	*Details*
AB vs CD	3.302	0.753	3.694	
A vs C	5.222*	0.131	3.533	NATC + NSC vs HSC
A vs E	0.863	4.800*	0.673	NATC + NSC vs LSC
B vs D	0.069	1.008	0.562	ATC + NSC vs HSC
B vs F	1.513	0.011	1.012	ATC + NSC vs LSC

* χ^2 critical = 3.841 (α =0.05, df = 1)

While the responses varied between versions, sunk cost could explain the differences in choices to outsource or not. Decisions not to outsource are sub-optimal due to the difference in favour of the cost savings. The respondents who chose not to outsource did not exhibit rational behaviour in their decision. The extent to which the results from

both the public hospitals and the private hospitals systematically differed provided support for the existence of the sunk cost effect.

H_{o2}: The decision to outsource will not be different because of *the level* of past investment (sunk cost).

Testing for this null hypothesis involved comparing the results from versions C and D (high level of sunk cost) against E and F (low level of sunk cost). To test H_{02} a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.8 presents the results of the 2 x 2 contingency table and Table 5.8a in Appendix D presents the details of the chi-square tests.

Table 5.8
Crosstabulation of Outsourcing Decision * Sunk Cost High/Low

Sunk Cost	*Outsource*		
	No	Yes	Total
High (CD)	61	13	74
Low (EF)	34	28	62
Total	95	41	136

Result: χ^2 sample = 12.198 (α =0.000, df = 1)
Decision: **Reject the null hypothesis.**
Computed χ^2 exceeds the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

The decision to outsource was shown to systematically differ between versions with a higher amount of sunk cost than those with a lower amount of sunk cost. The null hypothesis was also rejected for each of the two groups separately when tested.

Public Hospitals χ^2 sample = 7.883 (α =0.005, df = 1) **Reject the null hypothesis**

Private Hospitals χ^2 sample = 4.065 (α =0.044, df = 1) **Reject the null hypothesis**

The level of sunk cost in the version did have an impact on the decision to outsource. Versions E and F (low sunk cost) have a higher percentage of respondents choosing to outsource than in the corresponding versions C and D (high sunk cost).

Hypothesis Testing of Asset Specificity

H_{o3}: The decision to outsource will not differ due to asset specificity in the version.

The versions relevant to test this hypothesis were B, D, and F (asset specificity) compared to A, C, and E (no asset specificity). The results presented in Table 5.4

showed that for those versions in which asset specificity was present, the selection of the outsourcing option was lower than occurred in the corresponding versions that did not contain asset specificity. To test H_{05} a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.9 presents the results of the 2 x 2 contingency table and Table 5.9a in Appendix D presents the details of the chi-square tests.

Table 5.9
Crosstabulation of Outsourcing Decision * Asset Specificity No/Yes

Asset Specificity	*Outsource* No	Yes	Total
No (ACE)	60	54	114
Yes (BDF)	75	28	103
Total	135	82	217

Result: χ^2 sample = 9.377 (α =0.002, df = 1)
Decision: **Reject the null hypothesis.**
Computed χ^2 exceeds the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Therefore, the decision to outsource did systematically differ between versions with asset specificity against those without. The null hypothesis was also rejected for each of the two groups when tested separately.

Public Hospitals χ^2 sample = 5.736 (α =0.017, df = 1) **Reject the null hypothesis.**

Private Hospitals χ^2 sample = 3.787 (α =0.052, df = 1) **Reject the null hypothesis.**

Hypothesis Testing of Public versus Private Hospitals

H_{04}: The decision to outsource will not differ between private and public hospitals.

Analysis to test this null hypothesis focused on the difference between all the responses from both the public and private hospitals. To test H_{03} a chi-square test was performed to determine whether or not the observations of the two independent samples were significant.

Table 5.10 presents the results of the 2 x 2 contingency table and Table 5.10a in Appendix D presents the details of the chi-square tests.

Table 5.10
Crosstabulation of Outsourcing Decision * Public/Private Hospitals

Hospitals	*Outsource*		
	No	Yes	Total
Public	78	50	128
Private	57	32	89
Total	135	82	217

Result: χ^2 sample = 0.216 (α =0.642, df = 1)
Decision: **Cannot reject the null hypothesis.**
Computed χ^2 **does not** exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Therefore, the decision to outsource did not systematically differ between public and private hospitals.

Hypothesis Testing on Size of Organisation

H_{05}: The decision to outsource will not differ between hospitals of different size.

Analysis of the size of hospital was determined by categorisation based on the number of beds. The number of beds was selected as an approximate indicator of the likely number of patients and subsequently the possible level of demand for hospital meals. To test H_{04}, a chi-square test was performed to determine whether or not the observations of the four independent samples were significant. Table 5.11 presents the results of the 2 x 4 contingency table and Table 5.11a in Appendix D presents the details of the chi-square tests.

Table 5.11
Crosstabulation of Outsourcing Decision * Size of Hospital

Size measured by number of beds	*Outsource*		
	No	Yes	Total
Lowest - 100	97	50	147
101 – 200	19	13	32
201 – 300	7	10	17
301 to highest	12	9	21
Total	135	82	217

Result: χ^2 sample = 4.430 (α =0.219, df = 3)
Decision: **Cannot reject the null hypothesis.**
Computed χ^2 **does not** exceed the critical value: χ^2 critical = 7.815 (α =0.05, df = 3)

From the chi-square result, the decision to outsource did not differ between hospitals of different size. The null hypothesis could not be rejected for each of the two groups separately when tested.

Public Hospitals χ^2 sample = 3.295 (α =0.348, df = 3) **Cannot reject the null hypothesis.**

Private Hospitals χ^2 sample = 4.492 (α =0.213, df = 3) **Cannot reject the null hypothesis.**

Hypothesis Testing of Experience

H_{06}: The decision to outsource will not differ between respondents with different years of experience.

Experience of respondents was determined by the number of years of service in hospital management. To gain more meaningful data, the years of experience were collapsed into categories of a standard width. Collapsing or recoding nominal data is a common approach to acquiring useable data. Alreck and Settle (1985, 278) recommended three rules to maintain validity and reliability of the data: (1) the categories must be all inclusive; (2) the categories must be mutually exclusive; (3) there must be more variation in the thing being measured between categories than within categories. Transformation was performed in SPSS using the "recode into same variable" process. One subject did not provide a response to the years of experience question and was therefore excluded from this test. To test H_{06}, a chi-square test was performed to determine whether or not the observations of the six independent samples were significant. Table 5.12 presents the results of the 2 x 6 contingency table and Table 5.12a in Appendix D presents the details of the chi-square tests.

Table 5.12
Crosstabulation of Outsourcing Decision * Years of Experience

Years of Experience	*Outsource* No	Yes	Total
Lowest – 5	26	15	41
6 - 10	35	30	65
11 – 15	30	18	48
16 – 20	22	13	35
21 – 25	13	4	17
26 - highest	8	2	10
Total	134	82	216

Result: χ^2 sample = 4.773 (α =0.444, df = 5)
Decision: **Cannot reject the null hypothesis.**
Computed χ^2 **does not** exceed the critical value: χ^2 critical = 12.832 (α =0.05, df = 5)

Therefore, the decision to outsource did not differ between respondents with different years of experience. The null hypothesis also could not be rejected for each of the two groups separately when tested.

Public Hospitals χ^2 sample = 4.717 (α =0.451, df = 5) **Cannot reject the null hypothesis.**
Private Hospitals χ^2 sample = 3.270 (α =0.658, df = 5) **Cannot reject the null hypothesis.**

A further influence on the decision maker is previous experience with similar outsourcing choices.

H_{o7}: The decision to outsource will not differ between decision-makers who have previously considered outsourcing.

To test H_{07}, a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.13 presents the results of the 2 x 2 contingency table and Table 5.13a in the Appendix presents the details of the chi-square tests.

Table 5.13
Crosstabulation of Outsourcing Decision * Previously Considered Outsourcing No/Yes

Previously considered O/S	***Outsource*** No	Yes	Total
No	25	13	38
Yes	110	69	179
Total	135	82	217

O/S = Outsourcing

Result: χ^2 sample = 0.251 (α =0.617, df = 1)
Decision: **Cannot reject the null hypothesis.**
Computed χ^2 **does not** exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

The decision to outsource did not systematically differ between decision makers with prior experience in considering outsourcing proposals and those without by type of hospital. An interesting point is the high percentage of respondents that had previously considered some form of outsourcing.

To further test H_{07} in the public hospital sample, a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.14 presents the results of the 2 x 2 contingency table and Table 5.14a in Appendix D presents the details of the chi-square tests.

Table 5.14
Crosstabulation of Outsourcing Decision * Previously Considered Outsourcing * Previous Decision to Outsource No/Yes (Public Hospitals)

Previously considered O/S	*Outsource* No	Yes	Total
Prev Dec No	26	10	36
Prev Dec Yes	34	30	64
Total	60	40	100

O/S = Outsourcing

Public Hospitals χ^2 sample = 3.501 (α =0.061, df = 1) **Cannot reject the null hypothesis.**

Analysis of the results for public hospitals suggests that the high percentage of responses in favour of maintaining internal production was not significant. Applying the same approach to the private hospitals to test H_{07}, a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.15 presents the results of the 2 x 2 contingency table and Table 5.15a in Appendix D presents the details of the chi-square tests.

Table 5.15
Crosstabulation of Outsourcing Decision * Previously Considered Outsourcing * Previous Decision to Outsource No/Yes (Private Hospitals)

Previously considered O/S	*Outsource* No	Yes	Total
Prev Dec No	19	12	31
Prev Dec Yes	30	17	47
Total	49	29	78

O/S = Outsourcing

Private Hospitals χ^2 sample = 0.052 (α =0.820, df = 1) **Cannot reject the null hypothesis.**

Analysis of the results for private hospitals suggests that the high percentage of responses in favour of maintaining internal production was *not significant.*

A finding arising from these results was that the high percentage of respondents who previously considered the possibility of outsourcing chose not to outsource in this task. Prior experience with outsourcing may offer some explanation for the high percentage of respondents who chose internal production over outsourcing. This is especially important since the financial details presented in each of the versions should have resulted in the decision to outsource. Based on the financial data alone, a rational decision-maker would have chosen to outsource. However, respondents appeared to be influenced by factors and issues that they perceived as important due to their prior experience.

Table 5.16 provides details of issues which respondents identified as relevant in addition to the financial data presented. These issues were named even though the instrument and the accompanying letter specifically requested that *only* financial data be considered and clearly stated that quality was guaranteed. A high number of respondents still identified issues of quality, flexibility, experience and control as major factors contributing to their decision.

Table 5.16
Legend of Summarised Decision Issues

Category of comments		*Public*	*Private*
1	Staff and union issues	16	4
2	Size of hospital or regional area does not warrant outsourcing	5	1
3	Government policy does not favour outsourcing	3	0
4	Cost reduction is too small or minimal	23	21
5	Quality; flexibility; experience; control issues	30	34
6	Write-off not warranted (due to sunk cost)	17	6

Another issue raised by a number of respondents was that sunk cost was relevant and that to write off the item was not warranted (issue 6). This supports earlier research that decision makers have their own view of the relevance of sunk costs which may not follow the traditional concept of a rational decision maker. In addition, some respondents considered the cost reduction as too small or minimal. This also contradicts the traditional view that *any* saving is justification for a rational, or at least optimal, decision. A further summary showing the spread of comments across the different versions by respondents from public and private hospitals is provided in Table 5.17.

Table 5.17
Comments from Respondents Regarding Decision Issues

Category	*A*		*B*		*C*		*D*		*E*		*F*		$\bar{X}$	$\bar{X}$
	Pub	*Prv*	*Pub*	*Prv*	*Pub*	*Prv*	*Pub*	*Prv*	*Pub*	*Prv*	*Pub*	*Prv*	*Pub*	*Prv*
1	1		5		3	2	3	2	3		1		16	4
2	1								2		2	1	5	1
3	1						1		1				3	0
4	1	7	8	5	7	4	3	2	2	1	2	2	23	21
5	1	10	9	5	9	5	3	5	4	2	4	7	30	34
6					3	4	6		2		6	2	17	6

Hypothesis Testing of Gender Differences

H_{08}: The decision to outsource will not differ between respondents of different gender.

Gender has been raised in prior research as a possible reason for differences in decision making by management (Fagley & Miller, 1990). There were two respondents who did not provide a response to this question and were deleted from this sample for the purpose of testing this null hypothesis. To test H_{08}, a chi-square test was performed to determine whether or not the observations of the two independent samples were significant. Table 5.18 presents the results of the 2 x 2 contingency table and Table 5.18a in Appendix D presents the details of the chi-square tests.

Table 5.18
Crosstabulation of Outsourcing Decision * Gender

Gender	*Outsource*		
	No	Yes	Total
Female	64	41	105
Male	70	40	110
Total	13	81	215

Result: χ^2 sample = 0.165 (α =0.685, df = 1)
Decision: **Cannot reject the null hypothesis.**
Computed χ^2 **does not** exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

The decision to outsource did not differ between respondents of different gender. This indicates that there was no relationship between the two variables (gender and decision). The gender distribution of respondents across all five versions of the instrument is presented in Table 5.19.

Table 5.19
Gender of Respondents by Version

Version	χ^2 *sample*	α	*Fisher exact test P=2 tail*	*F*	*M*	*Reject or Not*
A	0.196	0.658	0.751	20	21	Cannot reject
B	0.169	0.681	0.736	15	21	Cannot reject
C	0.186	0.666	1.000	15	23	Cannot reject
D	0.004	0.952	1.000	18	17	Cannot reject
E	0.185	0.667	0.738	19	15	Cannot reject
F	2.917	0.088	0.129	18	13	Cannot reject

This finding was then tested for possible significance in the public and private hospitals separately. The 2 x 2 contingency table showing the results for the public hospital are

presented in Table 5.20 and Table 5.20a in Appendix D presents the details of the chi-square tests.

Table 5.20
Crosstabulation of Outsourcing Decision * Gender (Public Hospitals)

Gender	*Outsource*		
	No	Yes	Total
Female	41	36	77
Male	26	24	50
Total	67	60	217

Public Hospitals χ^2 sample = 0.019 (α =0.891, df = 1) **Cannot reject the null hypothesis.**

The 2 x 2 contingency table showing the results for the private hospitals are presented in Table 5.21 and Table 5.21a in Appendix D presents the details of the chi-square tests.

Table 5.21
Crosstabulation of Outsourcing Decision * Gender (Private Hospitals)

Gender	*Outsource*		
	No	Yes	Total
Female	23	34	57
Male	15	16	31
Total	38	50	88

Private Hospitals χ^2 sample = 0.529 (α =0.467, df = 1) **Cannot reject the null hypothesis.**

The null hypothesis could not be rejected for either of the two groups. Therefore, the finding of no relationship between gender and decision was confirmed for the two groups (public and private hospitals) separately.

Conclusions

In each of the six versions, a decision based on the financial data should have resulted in the choice to outsource. However, with the exception of versions A and E, the majority of subjects chose not to outsource. In other words, the majority of respondents chose internal production when the optimal choice based on the financial data should have led to the selection of the outsourcing option.

These results suggest that the decision makers who chose not to outsource did not make the optimal choice. There were, however, versions that did have a high percentage of

respondents that selected the option to outsource. These findings provided evidence that the decision-making behaviour of the majority of subjects violated the rational decision making model. Two possible variables were tested and offered as explanations for this observed behaviour: the sunk cost information and asset specificity.

The first possible explanation is that the behaviour may have been due to the sunk cost information. Responses from the survey that contained a sunk cost significantly differed from the survey that did not contain a sunk cost. Further evidence of the sunk cost effect was found by testing responses from the survey with a lower level of sunk cost against the responses from surveys with a higher level of sunk cost. The tests produced significant statistical differences. These findings are consistent with the expectations of a sunk cost effect being related to violation of the rational decision making model.

A second possible explanation is that asset specificity influenced the choice. Asset specificity was found to have an influence in the choice to outsource. The intention to outsource was lower for those versions in which asset specificity was present. This effect was found to be systematically different between the responses of versions with and without asset specificity. These findings are consistent with the expectations under transaction cost theory that decision makers will take into consideration any additional cost of doing business with an external supplier.

The most surprising result was that no significant difference could be found between the public and private hospitals. The reason for this may be explained by the managerial changes that have taken place in the public hospital sector. The lack of significant differences suggests that the managerial style and the resultant decision making is closer between the two sectors than anticipated. In particular, the attempts by the various State Governments to corporatise and privatise government instrumentalities, seems to have produced a change in the managerial style and risk propensity of the managers in the public sector hospitals. Whether this is due to changes in management at public hospitals or managerial changes in private hospitals is an issue for further research.

Contextual issues were examined and found not to be relevant factors in explaining the differences in decisions between survey versions. First, previous experience with making an outsourcing decision was not a contributing factor to the differences in

decisions. The difference between respondents who had previously considered an outsourcing option, and those who had not, was not statistically significant. This was surprising, as a number of respondents raised concerns about issues of a non-financial nature specifically and dissatisfaction with prior outsourcing arrangements. Second, years of experience did not provide a significant difference. Third, the size of the hospital did not have a bearing on the decision outcome. Limitations associated with aggregating the data may have biased these results. However, the recommended method for aggregating this type of data was strictly followed to overcome any such problems. The final consideration was for possible differences due to gender. There were no significant differences in the decision outcomes between genders.

The surveys asked respondents to provide comments regarding their decision. While not all respondents provided a comment, those that did mostly raised concerns regarding non-financial issues. Instructions provided with the survey clearly stated that only the financial information presented in the version should be used to reach a decision. Of major concern were issues of quality, flexibility, lack of control, and unsatisfactory prior experiences. These responses are consistent with the literature and imply that individuals may be conditioned or unduly influenced by past experiences when considering situations that are similar to prior decisions.

CHAPTER 6

Contextual Effects on Decision Making by Financial Planners: Sunk Cost, Framing and Cognitive Biases

Chapter Abstract

Recent research on financial decision-making situations indicates that contextual aspects of the financial information, or frame, influence the outcome of the decision. This study examined the effect of framing (negative or positive) on the problem of sunk cost and the influence of cognitive biases related to problem space and image compatibility. To assess the relevance of the framing effects, three versions of an investment task were submitted to financial planners for assessment. Financial planners were selected because they provide expert analysis of financial information upon which investment decisions are based. The cognitive biases of problem space and image compatibility were examined to reveal the risk perceptions of respondents. Due to their training, they were expected to be less subject to cognitive biases. The lack of research into decision making by financial planners was an added incentive.

A significant framing effect was identified as well as a significant sunk cost effect. Lowering the sunk cost produced a higher mean funding outcome and the amount granted was higher in the negative frame. A perception of responsibility was significantly correlated with the amount of funding granted; this is consistent with the theory that escalation behaviour is associated with feelings of responsibility. Both perception of the problem space and analysis of image compatibility produced unexpected results. The results indicated that positive-framed versions exhibited stronger cognitive relationships to problem space perceptions than negative-framed versions. Whilst low image compatibility was a significant predictor of the level of funding, high image compatibility was also a significant predictor of the level of funding granted.

Contextual Influences on Financial Decision Making

Decision making involving issues of finance and investments are as much a part of the management accounting field as they are to financial planning. Financial planners are charged with the responsibility of providing advice concerning investments intended to provide future financial security. The portfolio theory used in financial planning considers that all investors are "risk-averse" and seek to maximize their return for the level of risk they are prepared to accept (Markowitz, 1959). Whether financial planners' tolerance for risk is indicated by the nature of the investment choices they recommend is yet to be tested.

Research suggests that decision outcomes made by individuals vary in accordance with the positive or negative framing of an aspect in a problem. This framing of the situation influences the conceptualisation of the problem by the individual and financial decision-making situations are no different. Prospect theory suggests that a person's level of risk tolerance varies according to the way in which the prospects of the alternative courses of action are framed— as either positive (gains) or negative (losses) (Kahneman & Tversky, 1979).

Survey 2 applied the constructs of prospect theory to an investment analysis by financial planners. Prospect theory (Kahneman & Tversky, 1979) is a decision model involving a two-step process intended to explain human behaviour that violates expected utility theory. Chapter 6 presents the data analysis and results of Survey 2. The survey investigated the effect of framing and other contextual factors on decisions made by financial planners in an experimental setting. Financial planners were selected because they are recognised as experts in investment analysis through a process of professional training (Oskamp, 1965; Bradley, 1981; Sundali & Atkins, 1994).

Sunk Costs

According to finance theory, only future cash inflows and outflows should influence decisions. Sunk costs are by definition *"past and irreversible outflows. ... they cannot be affected by the decision to accept or reject the project, and so they should be ignored"* (Brealey & Myers, 1991, 95). Portfolio theory and the net present value method are commonly used to assess alternative investment opportunities. In an

investment decision, past costs (sunk costs) are deemed to be irrelevant. Despite this, there is evidence that sunk costs are not always ignored as prescribed; this is described as the "sunk cost effect" (Tversky & Kahneman, 1981; Arkes & Blumer, 1985).

Tversky and Kahneman (1981) suggested that individuals form psychological accounts regarding the advantages and disadvantages of an event or option in order to appraise costs and benefits of outcomes. Therefore, even though sunk costs may be irrelevant from an accounting perspective, the decision maker (regardless of experience) is likely to be influenced by the knowledge that sunk costs exist.

Empirical research indicated that decision makers tend to evaluate prospects with respect to some reference point (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981; 1986; 1991; Payne, Laughhunn & Crum, 1980). For example, Kahneman and Tversky suggested that a person's perception of wealth is determined by experiences of past and present stimuli. This suggests that past and present experiences, such as sunk costs, can influence the location of the reference point against which a particular outcome is judged as a gain or loss. In this study it was hypothesised that the inclusion of sunk costs would act as a reference point for the decision to provide additional funding and thus the decision outcomes would differ between the groups. The following hypothesis tested this assumption:

H_{o1}: The amount of funding granted will not be reduced by the level of past investment (sunk costs).

The expectation was that the level of funding would be different between groups as a consequence of the high and low sunk cost conditions (versions).

Framing Effects

Empirical research demonstrated that individuals are influenced by the way in which information is presented (Kahneman & Tversky, 1979). A frame according to Beach (1990, 23) is *"a mental construct consisting of elements, and the relationship between them, that are associated with a situation of interest to a decision maker."* The frame may therefore be thought of in terms of a representation of a situation through which a decision maker gains understanding or makes sense of the alternative courses of action available. According to prospect theory, decision makers tend to be risk-seeking when

the situation is framed in terms of losses but risk-averse in situations involving gains (Kahneman & Tversky, 1979). One explanation for this is that when a decision maker focuses on the negative, there is a greater urgency to engage in preventative behaviour rather than explore other options. March and Shapira (1992) suggested that individuals are survival oriented when focusing on losses which threaten to deplete their resources and more aspiration oriented when focused on positive goals. The assumption that decision makers are more influenced by negative framing is supported by the findings of prior research (Dunegan, 1993; Dunegan, Duchon & Ashmos, 1995).

This study was concerned with testing decision outcome differences within a negative framed version to shed more light on behaviour in a situation involving losses in an investment task. There is no empirical evidence that positive manipulation of the frame derives a framing effect. Since *"losses loom larger than gains"* according to Kahneman and Tversky (1979), it seemed useful to examine the extent to which the propensity to take risks would be supported empirically by the responses of real life financial planners. To test this supposition, the following hypothesis was developed.

H_{o2}: The amount of funding provided will not differ between subjects due to framing of the version.

Escalation of Commitment as a Responsibility Factor

Staw (1976, 1981) found that individuals tend to escalate their commitment to previous decisions, even if the behaviour is not rational. Abundant research has shown that individuals who make an initial decision are more likely to make further decisions in a biased way to justify their earlier decision (Staw & Ross, 1978; Teger, 1980; Bazerman, Beekun & Schoorman, 1982; Bazerman, Guiliano & Appleman, 1984). A consequence of this bias is that resources are committed to justify previous actions, whether or not the rationale for those initial commitments is still valid (Brockner & Rubin, 1985; Schoorman, 1988). The possibility that escalation to commitment may be occurring in investment appraisal led to the following null hypothesis:

H_{o3}: The amount of funding will not be significantly different between subjects due to their perceived level of responsibility for the initial decision.

This null hypothesis tested whether escalation to commitment is a contributing factor to observed decision behaviour.

Problem Space

The role of cognition is well documented as a salient factor in decision making (Newell & Simon, 1972; Lord & Maher, 1990). The information processing theory of Newell and Simon (1972) consists of three major constructs: the information processing system, the task environment and the problem space. The problem space refers to the conceptual representation of the task constructed by the individual (Payne, 1980, 95). Problem space provides further insight into the differences between decision outcomes made by subjects. Payne (1980) referred to these perceptions collectively as the problem space or the individual's cognitive representation of a task environment. The inclusion of problem space in decision research also provides better understanding of behaviour anomalies related to risky choice. Kahneman and Tversky (1979) suggested these anomalies are due to the manner in which the problem is coded, edited and represented mentally by the decision maker. These issues are linked with the problem space construct; research exploring these processes exists (Bowen, 1987; Lord, 1985).

Dunegan (1993) examined the influence of framing on the perceptual processes which are thought to proceed the eventual actions of decision makers. The null hypothesis below tests whether differences in perception of the problem space explain the decision outcomes in view of Dunegan's (1993) call for more research on the extent to which framing effects can influence cognitive processes.

$H_{04:}$ The perceptions of the problem space will not differ between versions due to the framing effect.

The way in which decision makers process information can be measured by the cognitive perception of the problem space which can be characterised and controlled in automatic mode (Isen, 1984; Langer, 1989a, 1989b; Fazio, 1990; Maheswaran & Chaiken, 1991; Louis & Sutton, 1991). When controlled modes of cognitive processing are used, information is subjected to more comprehensive, deliberate and thorough analysis. When automatic modes are used, the processing of information is limited, there is reduced attention to detail, and fewer incoming cues contribute to a cognitive representation of the task (Dunegan, 1993). Controlled processing is expected to produce a significant relationship between problem space measures and decision outcomes (funding) because problem space should be more easily recalled and used in the controlled mode. In the automatic mode, the problem space is not easily recalled for

conscious use and the relationship between problem space and decision outcomes should be weak or non-significant.

H_{05}: The eight problem space variables will not significantly explain the variance in funding. [S2]

This null hypothesis tests whether different perceptions of the problem space due to framing would produce different decision outcomes.

The eight problem space items used in this survey are:

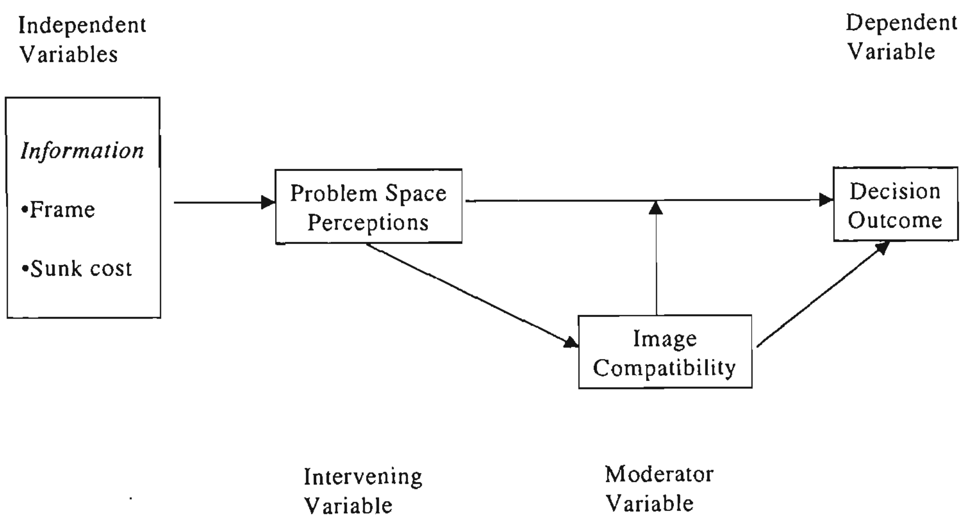
1. Indicate the level of risk you believe is associated with providing the additional funds. Anchored by No Risk – Too Risky
2. How responsible do you feel for the initial decision to undertake the project? Anchored by Not Very Responsible – Very Responsible
3. How disappointed are you about the present conditions of the project? Anchored by Not Too Disappointed - Very Disappointed
4. How important do you think this decision is? Anchored by Not Very Important – Very Important
5. What is the likelihood you would fund the request? Anchored by Reject Request - Fund Request
6. At this point, what would be more important? Anchored by Minimise Losses - Maximise Gains
7. I have already invested so much it seems foolish not to continue. Anchored by Strongly Disagree – Strongly Agree
8. Responsibility for the success of the project is. Anchored by Out of my Control - Under my Control

Image Compatibility

Image theory predicts that decisions made by individuals are a function of the perceptions of three images (Beach, 1990; Beach & Mitchell, 1990; Mitchell & Beach, 1990). The three images are value images, pertaining to a consolidation of morals, principles and predispositions; trajectory images, pertaining to an individual's future objectives or targets; and strategic images, consisting of current plans and tactics (Mitchell, Rediker & Beach, 1986; Dunegan, Duchon & Ashmos, 1995). These images are relevant to decisions concerning adoption and progress choices. Adoption decisions are concerned with new projects, plans, or activities. Progress decisions are related to deliberations concerning projects, plans or activities already commenced. These are the types of activities associated with investment appraisal. The model proposed by Dunegan, Duchon and Ashmos (1995) was adapted by allowing for specific types of variable manipulation— framing and sunk cost— and classifying the variables

according to the model. Figure 6.1 demonstrates the predicted relationships between the problem space and image compatibility that were tested in this survey research.

Figure 6.1
Information Use, Image Compatibility and Problem Space



Source: adapted from Dunegan, Duchon & Ashmos (1995, 33)

Dunegan, Duchon and Ashmos (1995, 32) indicated that in both adoption and progress decisions image compatibility acts as a catalyst for differentiated actions. When information is perceived as positive, the trajectory and strategic images are compatible and no change in course of action is deemed to be warranted by a decision maker. Conversely, when information is perceived as negative, images appear incompatible and the decision maker is more likely to take action intended to rectify the situation (Beach et al., 1992). Dunegan, Duchon and Ashmos (1995) also found that image compatibility acted as a moderating variable influencing the degree to which information was used by a decision maker in choosing a course of action.

The following hypothesis tested the role of problem space and image compatibility.

H_{06}: The perceptions of the problem space and perceived image compatibility will not be the same for each individual subject.

Dunegan, Duchon and Ashmos (1995) found that when image compatibility was high and progress toward the goal on their trajectory image was perceived to be acceptable, then the association between the problem space and funding levels was weak. When

image compatibility was low, the association between the problem space and funding decisions was significantly higher. The following hypotheses tested these findings.

H_{07}: The perceived image compatibility will not differ between decision outcomes.
H_{08}: The perceptions of the problem space and decision outcomes will not be stronger when perceived image compatibility is low.

The image compatibility items were preceded by the instructions:

Please mentally, conjure up two images of this project, a "current image" (reflecting conditions as they are now) and a "target image" (the way you would eventually like them to be).

The four image compatibility items used in this survey are:

1. How close is the "current image" to the "target image"? Anchored by Not Very Close - Very Close
2. Is your "current image" of this project moving toward your "target image"? Anchored by Definitely Not – Absolutely
3. Given your "current image" of this project, what is the likelihood that your "target image" will be realised? Anchored by Very Likely – Not Very Likely
4. In terms of "ultimate" project objectives, how well is the project doing? Anchored by Not Very Well - Very Well

Data Collection

Target Population and Sample Selection

The target population was selected from the category of financial planners in the Australian Yellow Pages Telephone CD Rom 1999 edition. Several stages were involved in developing the database for the sample. First, the search was restricted to Queensland Financial Planners: a total population of 863. This was done to keep the survey at a manageable level and in the belief that the issues presented in the survey instruments would be relevant to financial planners, no matter where in Australia they were situated. Second, as accountants were surveyed in a separate study, financial planners who also offered accounting services were deleted from the population. Third, a sample of 265 was randomly selected from the remaining population. The random sampling method followed the steps prescribed by Sekaran (1992).

Design of Questionnaire and Survey

The wording of the instrument was modified to suit the financial planners and investment advisors who were the designated subjects for this research. As the instrument was based on prior research and otherwise identical to the task used in Chapter 7, which was tested no further testing was conducted.

Validity and Reliability

The first goal of questionnaire design is to obtain information relevant to the purpose of the survey (Fowler, 1988; Alreck & Settle, 1985). To satisfy this requirement, the specific task questions were based on prior studies from pertinent literature. The second goal of questionnaire design is to collect information with maximum reliability and validity (Alreck & Settle, 1985; Fowler, 1988). The development of the survey from the literature were used as a means of addressing the need for adequate coverage of the subject matter as well as providing for internal and content validity.

To be able to generalise to a particular population, the information must have external validity. Random sampling was used to assure that the sample was representative of the population (Kerlinger 1986). Reliability of a survey questionnaire depends on the degree to which the instrument provides consistent results (Kerlinger, 1986). The method most commonly used in mail survey questionnaires to test for consistency is the split-half procedure. This involved checking the results from one half of the respondents against the other half. The instrument was kept to two pages to minimize the amount of time required of respondents and administrative procedures adopted in conformity with the suggestions of Frazer and Lawley (2000, 79). To improve response rate and overcome the limitations of mail surveys (Sekaran, 1992, 201; Emory & Cooper, 1991, 334; Berdie, Anderson & Niebuhr, 1986, 42) the following techniques were used in this study: short simple wordings, cover letter, incentive to return the survey for a report and to avoid follow up, confidentiality, telephone fax and email contact.

Survey Instruments

The versions of the task for this research were based on research reported by Dunegan (1993) with modifications derived from Dunegan, Duchon and Ashmos (1995). In Dunegan (1993), the task refered to a "Research and Development Manager" and in Dunegan, Duchon and Ashmos (1995), the decision maker was cast as "Vice-President/General Manager." In this research, the decision maker was referred to as the "Fund Manager". This title was used to compliment the nature of financial planning and investment advising consistent with the industry role of the subjects. To enable comparative analysis to be drawn between accountants and financial planners, the basic format and the specific financial data was consistent with that used in Chapter 7.

There were three versions each differing slightly with regard to specific details. The first two contained the same amount of sunk cost, however, one had a positive frame and the other a negative frame. The third version had a negative frame, and the amount of the sunk cost was reduced. In addition to the framing and sunk cost manipulations there were questions which addressed cognitive perceptions of problem space and image compatibility in all three versions.

In introducing the instrument's task, the subjects were asked to adopt the role of a Fund Manager who, having instigated an investment project sometime in the past, is now confronted with a request for additional funds by the team responsible for the investment project. The team is seeking an additional $100,000 as the investment project is behind schedule and over budget. The sunk cost of the initial investment was identified as $400,000. This was considered a reasonable amount to influence the subjects as the $100,000 requested represented one quarter of this sunk cost. The Fund Manager has $500,000 in unallocated funds; however these funds may be required for other projects and there is some time left before the end of the current financial year. The details of the differences between the sunk cost and framing for the three versions are highlighted in Table 6.1 below.

Table 6.1
Summary of Survey 2 Details for Investment Decision (N=86)

Version	*Wording*	*Framing*
1 (n=31)	High Sunk Cost ($400,000)	Negative
2 (n=33)	High Sunk Cost ($400,000)	Positive
3 (n=22)	Low Sunk Cost ($100,000)	Negative

The subjects were instructed that they believe there is a "fair chance" the project will not succeed. The final statement given to the subjects specifically established the pertinent framing effect. The positive frame stated that, *"Of the projects undertaken by this team, 30 of the last 50 have been successful"*, while the negative frame differed with respect to the last part of the statement *"Of the projects undertaken by this team, 20 of the last 50 have been unsuccessful"*. In both the negative and positive versions, the ratios lead to the same result.

Subjects were told that the actual time remaining till the end of the financial year was 6 months; this imposed a time frame that was considered a reasonable challenge to the subject's perception of risk. The subjects could view the 6 months as half the year being past or as half the year remaining (Dunegan, 1993). The variables for this version are summarised in Table 6.2 below:

Table 6.2
Summary of Variables for Investment Decision

Variable Category	*Number*	*Details*
Treatment Effect: (Treatment Variables)	Two	Framing (positive vs negative) Sunk Cost (high vs low)
Demographic Variables: (Independent Variables) [Predictors]	Two	Problem space inventory Image compatibility
Dependent Variables: (Criterion Variables)	Two	Choice to provide NIL funds Choice to provide a level of funds

Survey Response

Sample Size and Response Rate

Where the actual population is known, the statistical method for determining an appropriate sample size can be employed. In this case the appropriate sample size was determined to be 327 (N=850 s= 265) (Leedy, 1997, 211). Following the initial mail out of surveys, 30 were returned with the notification that the address was no longer correct. These were replaced by randomly selecting 30 replacements. Eighty-six useable responses were received; the response rate was 32.5%. This response rate was considered satisfactory for the size of the population and the purpose of the survey.

Non-Response Bias

The likelihood of non-response bias was assessed using late responses as a proxy for non-responses. A comparison of the variables provided little difference between early and late respondents. Because the data was a mixture of ordinal and nominal testing early/late responses was conducted using the SPSS "Ordinal Regression" which produced a chi-square of the model fit, χ^2 61.824 (α =0.308, df = 57), presented in Table 6.3 below. An independent samples t-test was also conducted to test the equality of the means for each variable, Table 6.3a in Appendix E. No items were significantly different between early and late responses. The results of the early/late responses suggest that the non-response bias was not to a threat to validity. Since the subjects were

selected from a population that was known to be largely homogenous, major differences between respondents was unlikely.

Table 6.3
Analysis of Early/Late Responses

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	61.825			
Final	.000	61.824	57	.308

Link function: Logit.

Data Analysis

Statistical Methods

The data obtained from the survey was primarily ordinal data derived from Likert-scale responses to issues concerning the decision and the amount of funding provided. Ordinal data not only categorises data, it also allows for data to be ordered by degree (Argyrous, 1996). Data gathered using a Likert scale may be treated as ordinal or interval according the type of data and the structure of the scale items in the survey instrument (Sproull, 1995, 68; Huck, Cormier & Bounds, 1974, 216; Isaac & Michael, 1990, 177). Interval data is comprised of constant units of measurement in which the differences between any two adjacent points on any part of the scale are equal (Argyrous, 1996). The most appropriate inferential statistic for ordinal/interval data is the F-test, one way analysis of variance (de Vaus, 1991).

Eight null hypotheses were generated with regard to the investment decision versions. These called for the use of a t-test (for null hypothesis 1), ANOVA (for null hypotheses 1, 2 and 3), a MANOVA (for null hypothesis 4) and multiple regression analysis (for null hypotheses 6, 7, and 8). A principal component factor analysis was conducted as an additional test on the data regarding the perceptions of problem space and image compatibility. The results and their interpretation are discussed below. The results of the analysis of the data are presented in order of the null hypotheses established earlier in this chapter.

Results

Analysis of Reliability

Table 6.4 presents the mean and standard deviations for the funding amounts and the total subjects in the sample for each of the versions that were administered.

Table 6.4
Descriptive Details of Investment Decision Versions

Version	*N*	*Mean*	*Std. Deviation*
1 Negative~S/C High	31	39,354	22,536
2 Positive~S/C High	33	53,484	25,601
3 Negative~S/C Low	22	60,227	29,296
Total	86	50,116	26,667

S/C = Sunk cost

There was a difference between the means of the negative-framed and positive-framed versions. Having established that the funding levels were significantly different between the versions, the first null hypothesis examined the significance of the framing effect on the amount of funding.

Testing the Sunk Cost Effect on Funding

H_{o1}: The amount of funding will not be reduced by the level of past investment (sunk costs).

To test H_{o2}, a one way analysis of variance (ANOVA) was conducted with the funding (decision outcome) as the dependent variable and framing (dummy coded) as the independent variable, Table 6.5. The versions relevant to the test were version 1 (negative framing with high sunk cost) and version 3 (negative framing with low sunk cost).

Table 6.5
ANOVA Details of Sunk Cost Effect on Funding

ANOVA

AMT

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		5.61E+09	1	5606020722	8.596	.005
	Linear Term	Unweighted	5.61E+09	1	5606020722	8.596	.005
		Weighted	5.61E+09	1	5606020722	8.596	.005
Within Groups			3.33E+10	51	652175694.3		
Total			3.89E+10	52			

Result: ANOVA between versions "1 & 3", F = 8.596, (p<0.005, df = 1)
Decision: **Reject the null hypothesis.**

The results show a significant difference between the mean of funding for the high sunk cost frame and the low sunk cost frame versions. The direction of the difference was a low level of funding ($39,354) in the high sunk cost versions and the high level of funding ($60,227) in the low sunk cost versions, Table 6.6. This suggests that the amount of sunk cost creates the sunk cost effect, as predicted.

Table 6.6
Means Testing of High and Low Sunk Cost

Group Statistics

	H02	N	Mean	Std. Deviation	Std. Error Mean
AMT	1	31	39354.84	22536.71	4047.71
	3	22	60227.27	29296.40	6246.01

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMT	Equal variances assumed	2.434	.125	-2.932	51	.005	-20872.43	7119.15	35164.72	-6580.15
	Equal variances not assumed			-2.804	37.689	.008	-20872.43	7442.89	35943.87	-5801.00

Testing the Framing Effect on Funding

Funding (or resource allocation from $0 to $100,000) was the dependent variable and framing (dummy coded 1 or 2) was the independent variable in H_{o2}.

> H_{o2}: The amount of funding provided will not differ between responses due to framing of the version.

A comparison of the means using a two-sample independent *t*-test (two-tailed) revealed a significant difference between funding levels ($t = 6.501$, $p < .001$). This result indicates that the frame manipulation was successful.

To test the difference between the experimental conditions (decision choices versus positive and negative framing), an analysis of variance for repeated measures was performed. Since each of the four groups was treated identically, except for framing; differences were expected among them. The results of the ANOVA are presented in Table 6.7. Further multiple comparisons are provided in Table 6.7a in Appendix E, showing the direction of the significant differences between versions.

Table 6.7
ANOVA Details of Investment Task

ANOVA

AMT

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		6.21E+09	2	3106817187	4.755	.011
	Linear Term	Unweighted	5.61E+09	1	5606020722	8.579	.004
		Weighted	5.94E+09	1	5939277236	9.089	.003
		Deviation	2.74E+08	1	274357138.4	.420	.519
Within Groups			5.42E+10	83	653436178.7		
Total			6.04E+10	85			

Result: Version 1 vs 2, ANOVA, $F = 4.755$, ($p = 0.011$, $df = 2$)

Decision: **Reject the null hypothesis.**

The result confirms that the total variance in funding was significantly related to the differences in framing. Table 6.8 compares version 1 against version 2. Further multiple comparisons are provided in Table 6.8a and 6.8b in Appendix E, showing the direction of the significant differences between versions.

Table 6.8
Significant Differences in Amount of Funding between Versions 1 and 2

Group Statistics

	PAPER	N	Mean	Std. Deviation	Std. Error Mean
AMT	1	31	39354.84	22536.71	4047.71
	2	33	53484.85	25601.66	4456.68

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMT	Equal variances assumed	1.327	.254	-2.338	62	.023	-14130.01	6044.75	-26213.30	-2046.72
	Equal variances not assumed			-2.347	61.749	.022	-14130.01	6020.46	-26165.71	-2094.31

The sunk cost effect was significant with the mean for funding being greater in the version with the lower sunk cost.

Testing the Perception of Responsibility on Funding

H_{o3}: The amount of funding will not be different between respondents due to their perceived level of responsibility for the initial decision.

To test H_{03}, a one-way analysis of variance (ANOVA) was conducted with the problem space item for responsibility, Table 6.9. Testing had funding (from \$0 to \$100,000) as the dependent variable and perceived level of responsibility (scaled from 1 to 5) as the independent variable.

Table 6.9
ANOVA Details for Perception of Responsibility

ANOVA

AMT

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		1.00E+10	4	2504773405	4.023	.005
	Linear Term	Unweighted	9.73E+09	1	9734188264	15.635	.000
		Weighted	8.86E+09	1	8862547207	14.235	.000
		Deviation	1.16E+09	3	385515470.9	.619	.605
Within Groups			5.04E+10	81	622589427.0		
Total			6.04E+10	85			

Result: The result of the ANOVA was F = 4.023 (p =0.005, df = 4)
Decision: **Reject the null hypothesis.**

This result shows there were statistically significant differences between the perception of responsibility and the amount of funding. The total variance of means is presented in Table 6.8a in Appendix E, providing multiple comparisons which show the direction of the significant differences between levels of perceived responsibility and funding amounts.

The result in Table 6.10 below shows there were no statistically significant differences between the perception of responsibility and the intention to fund.

Table 6.10
ANOVA Details for Perceived Responsibility/Intention to Fund

ANOVA

LIKELY

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.198	4	.799	.809	.523
Within Groups	80.012	81	.988		
Total	83.209	85			

LIKELY

	RESP	N	Subset for alpha = .05
			1
Scheffe[a,b]	4	26	3.35
	2	13	3.38
	5	12	3.58
	1	15	3.73
	3	20	3.80
	Sig.		.799

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 15.854.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Result: The result of the ANOVA was F = 0.809 (p =0.523, df = 4).
Decision: **Cannot reject the null hypothesis.**

The next section is concerned with examining the intervening and moderating variables identified in the model presented in Figure 6.1. The focus of the following tests is on perceptions of problem space and image compatibility.

Testing the Framing Effect on Perceptions of Problem Space

H_{04}: The perceptions of the problem space will not differ between versions due to the framing effect.

To test H_{04}, a multivariate analysis of variance (MANOVA) was conducted with framing (dummy coded) as the independent and eight (8) problem space items as dependent variables; the details are presented in Table 6.11. The test was restricted to version 1 (negative frame and high sunk cost) and version 2 (positive frame and high sunk cost).

To compare version 2 against version 3 would introduce a confounding variable, as version 3 consisted of a negative frame and a low sunk cost, which could invalidate the findings.

Table 6.11
MANOVA Details for Perceptions of Problem Space

Between-Subjects Factors

		N
H01	1	31
	2	33

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.986	484.002[a]	8.000	55.000	.000
	Wilks' Lambda	.014	484.002[a]	8.000	55.000	.000
	Hotelling's Trace	70.400	484.002[a]	8.000	55.000	.000
	Roy's Largest Root	70.400	484.002[a]	8.000	55.000	.000
H01	Pillai's Trace	.245	2.235[a]	8.000	55.000	.038
	Wilks' Lambda	.755	2.235[a]	8.000	55.000	.038
	Hotelling's Trace	.325	2.235[a]	8.000	55.000	.038
	Roy's Largest Root	.325	2.235[a]	8.000	55.000	.038

a. Exact statistic

b. Design: Intercept+H01

Result: 1 vs 2 MANOVA $F=2.235$, $p<.038$

Decision: **Reject the null hypothesis**

The result indicates that the perception of problem space differs between version 1 (negative frame) and 2 (positive frame). There is a significant difference (at $\alpha = .05$) due to framing. Interestingly, the mean of the funding amount was lower in the negative frame ($39,354) than in the positive frame ($53,484).

Having established the influence of a framing effect on the perceptions of problem space, the next null hypothesis was concerned with testing the relationship between the problem space items and the variance in funding allocation. Prior research suggested that framing could be expected to act as a catalyst for different modes of cognitive processing. Negative framing should elicit a higher use of controlled decision processes and positive framing more automatic modes of decision processes. The first stage involved performing multivariate regression analyses for each of the framing conditions (versions). The results are presented in Tables 6.12, 6.13, and 6.14.

H_{05}: The eight problem space variables will not significantly explain the variance in funding.

To test the null hypothesis, a multiple regression analysis was performed: one for each framing condition with funding as the criterion variable and all eight problem space variables simultaneously entered as predictors. The reason for entering all eight problem space variables in the model simultaneously was to control for any shared variance among the predictors. Details of the tests are shown in Table 6.12 below and Table 6.12a in Appendix E.

Table 6.12
Multiple Regression – Funding Regressed on All Eight Problem-Space Measures (Negative~1)

	Measure	*F*	*dfs*	*R^2*	*Adjusted R^2*	*Standardised beta coefficients*
1	Funding	2.149	8, 22	.439	.235	
2	Intentions					0.504
3	Risk					-0.192
4	Disappointment					-0.215
5	Importance					0.020
6	Responsibility					0.162
7	Minimise loss					0.279
8	Sunk costs					-0.028
9	Control					-0.059

Model Summary

Model	R NEG1 = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.662[a]	.439	.235	19717.59

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, MINI, RESP, RISK, IMPORT, SUNK

Result: 1 (negative frame) Multiple Regression F=2.149 (8,22), p<0.074
Decision: **Cannot reject the null hypothesis.**

While 43.9% of the variance in funding was explained by the eight independent variables in the negative-framed versions, the results are not significant. The perceptions of problem space are not significantly related to the funding decision in the negative-framed sample. This is a surprising and most unexpected result and inconsistent with previous findings. Details of the tests are shown in Table 6.13 below and Table 6.13a in Appendix E.

Table 6.13
Multiple Regression – Funding Regressed on All Eight Problem-Space Measures (Positive~ 2)

	Measure	*F*	*dfs*	*R^2*	*Adjusted R^2*	*Standardised beta coefficients*
1	Funding	5.122*	8, 24	.631	.507	
2	Intentions					0.248
3	Risk					-0.559
4	Disappointment					0.002
5	Importance					0.254
6	Responsibility					0.289
7	Minimise loss					0.193
8	Sunk costs					0.206
9	Control					-0.152

Significant at $p < 0.001$

Model Summary

Model	R POS2 = 2 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.631	.507	17966.99

a. Predictors: (Constant), CONTROL, RESP, DISAP, LIKELY, MINI, RISK, SUNK, IMPORT

Result: 1 (positive frame) Multiple Regression $F=5.122$ (8,24), $p<0.001$
Decision: **Reject the null hypothesis.**

This means that 63.1% of the variance in funding was significantly explained by the eight independent variables (perception of problem space) in the positive-framed versions. Details of the tests are shown in Table 6.14 below and Table 6.14a in Appendix E.

Table 6.14
Multiple Regression – Funding Regressed on All Eight Problem-Space Measures (Negative~ 3)

	Measure	*F*	*dfs*	*R^2*	*Adjusted R^2*	*Standardised beta coefficients*
1	Funding	3.223*	8, 13	.665	.459	
2	Intentions					0.358
3	Risk					-0.272
4	Disappointment					-0.329
5	Importance					-0.104
6	Responsibility					0.310
7	Minimise loss					0.233
8	Sunk costs					0.173
9	Control					-0.139

* Significant at $p < 0.030$

Model Summary

Model	R NEG2 = 3 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.815[a]	.665	.459	21556.78

a. Predictors: (Constant), CONTROL, RESP, RISK, SUNK, MINI, IMPORT, LIKELY, DISAP

Result: 1 (negative frame, low sunk cost) Multiple Regression F=3.223 (8,13), p<0.030
Decision: **Reject the null hypothesis.**

This means that 63.1% of the variance in funding was significantly explained by the eight independent variables in the positive-framed versions. Two of the framing conditions were significant. The positive-framing condition accounted for 63.1% of the variance in funding allocations, F=5.122 (8,24), p<.001. The negative-framing condition (low sunk cost) accounted for 66.5% of the variance in funding allocations, F=3.223 (8,13), p<.030.

To determine whether significant differences existed between the predictive powers of the regression models, a comparison was conducted of adjusted R^2 values using Fisher's transformation for multivariate R (refer Hayes, 1988, 644-645). The capacity of the positive frame model was significantly greater.

Negative Frame = C_R = 0.388; critical value = 1.96 , two-tailed test, not significant.

Positive Frame = C_R = 2.08; critical value = 1.96 , two-tailed test, **significant.**

Negative Low Sunk Cost Frame = C_R = 1.270 ; critical value = 1.96, two-tailed test, not significant.

These results are not consistent with previously reported findings and indicate that the positive-framed versions exhibited stronger cognitive relationships to the problem space perceptions than the negative-framed versions. This is incongruent with the findings of Dunegan Duchon and Ashmos (1995). They found that negative framing resulted in a stronger relationship to the amount of funding.

A number of possible explanations and observations are considered here. First, that the negative-framing did not elicit the expected cognitive behaviour may be due to the unexpected risk-avoidance exhibited in the negative-framed outcomes. The negative frame should cause decision makers to exhibit risk-seeking behaviour, which would be manifest in the mean of the funding being larger (not smaller) than the positive-framed

version outcomes. Second, the additional information and modifications to the wording of the task may have been responsible. The respondents may have felt more certainty about the financial situation; this could explain the higher funding in the positive framed version. The significantly higher amount of funding in the positive frame suggests that the information may well have influenced characteristics of the cognitive modes exhibited by the subjects in their decision making.

Analysis of Internal Structure Image Compatibility

The internal structure of the four image compatibility items was explored by a principal-component analysis using an orthogonal Varimax rotation. By specifying a minimum eigenvalue of 1.0, a single factor for image compatibility was determined. The factor accounted for 81.7% of the variance in the four items. The items were collapsed into a single measure of image compatibility. The procedure for collapsing the data involved adding the scores of the four items to produce a single measure (Dunegan, Duchon & Ashmos, 1995). The component matrix is reported in Table 6.15.

Table 6.15
Component Matrix

	Component
	1
Close	.923
Terms	.914
Moving	.909
Given	.870

Extraction method: Principal Component Analysis.
Only one component was extracted. The solution cannot be rotated.

Descriptive statistics for the survey items are shown in Table 6.16. These data indicate that funding levels were significantly correlated with image compatibility and all but three of the problem space items, Importance, Minimise Loss and Control.

Table 6.16
Overall Means, Standard Deviations and Correlations (N=86)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	50.11	26.67	-								
2	Image	17.84	6.08	.674*								
3	Intentions	3.65	.97	.300*	.188							
4	Risk	3.56	.99	-.446*	-.425*	.046						
5	Disappointment	3.29	1.12	-.310*	-.258#	-.003	.448*					
6	Importance	3.67	1.11	.081	.039	.079	.071	.286*				
7	Responsibility	3.08	1.31	.383*	.291*	-.024	-.153	.032	.333*			
8	Minimise loss	2.60	1.28	.155	.084	-.132	-.177	-.208	-.133	.005		
9	Sunk costs	3.95	1.37	.243#	.170	.316*	.106	.124	-.018	.146	-.407*	
10	Control	4.27	1.54	-.064	-.014	.048	-.045	.119	.344*	.112	.078	-.167

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Testing the Correlation Between Perceptions of Problem Space and Image Compatibility

H_{06}: The perceptions of the problem space and perceived image compatibility will not be the same.

To test the null hypothesis H_{05} two regression analyses were performed to control for shared variance among problem space items. First, funding (decision outcome) was regressed on the eight problem space items. Details of the tests are shown in Table 6.17 below and Table 6.17a in Appendix E.

Table 6.17
Multiple Regression Details for Problem Space and Image Compatibility

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.709[a]	.503	.451	19758.86

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.04E+10	8	3798382587	9.729	.000[a]
	Residual	3.01E+10	77	390412682.0		
	Total	6.04E+10	85			

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

b. Dependent Variable: AMT

Result: Fifty percent of the variance in funding was predicted by the group of eight problem space items (F=9.729, p<.000).
Decision: **Reject the null hypothesis.**

Second, image compatibility (collapsed measure) was regressed on the eight problem space items. Details of the tests are shown in Table 6.18 below and Table 6.18a in Appendix E.

Table 6.18
Multiple Regression Details for Problem Space and Image Compatibility (Collapsed)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.945[a]	.893	.882	.79

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	400.362	8	50.045	80.244	.000[a]
	Residual	48.022	77	.624		
	Total	448.384	85			

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

b. Dependent Variable: IMAGE

Result: Eighty-nine percent of the variance in image compatibility was predicted by the group of eight problem space items (F=80.244, p<.000).
Decision: **Reject the null hypothesis.**

These results indicate that there was a significant relationship between perceptions of the problem space and perceived image compatibility. This finding is consistent with Dunegan, Duchon and Ashmos (1995).

The null hypothesis H_{07} was concerned with the relationship between the perceived image compatibility and the decision outcome.

H_{07}: The perceived image compatibility will not differ between decision outcomes.

Three steps were involved to test image compatibility as a moderating variable on decision outcome. First, to test whether image compatibility added anything to the predictive powers of the model used to test H_{05}, the same regression analysis was performed (Table 6.19) — except that in this model, image compatibility (the factor

condition) was added to the independent variables (that is, Funding = Intentions + Risk + Disappointment + Importance + Responsibility + Minimise loss + Sunk costs + Control + Image).

Table 6.19
Regression Analysis for Perceived Image Compatibility

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.741[a]	.550	.496	18922.99

a. Predictors: (Constant), IMAGE, LIKELY, CONTROL, MINI, IMPORT, SUNK, RISK, DISAP, RESP

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.32E+10	9	3692753995	10.313	.000[a]
	Residual	2.72E+10	76	358079621.8		
	Total	6.04E+10	85			

a. Predictors: (Constant), IMAGE, LIKELY, CONTROL, MINI, IMPORT, SUNK, RISK, DISAP, RESP

b. Dependent Variable: AMT

Result: Regression Model $R^2 = 0.550$, $F = 10.313$ $p<0.000$.
Decision: **Reject the null hypothesis.**

This result showed that the model's ability to predict funding increased from 50% to 55% with the addition of image compatibility. Second, the regression model was then expanded to include the eight first-level interactions between image compatibility and the problem space items, Table 6.20. The interaction variables were created by multiplying each problem space item by the image compatibility factor, as reported by Dunegan, Duchon and Ashmos (1995, 35). The expanded model is represented by the following [Funding = Intentions + Risk + Disappointment + Importance + Responsibility + Minimise loss + Sunk costs + Control + Image + (Intentions * Image) + (Risk * Image) + (Disappointment * Image) + (Importance * Image) + (Responsibility * Image) + (Minimise loss * Image) + (Sunk costs * Image) + (Control * Image)].

This result showed that the model's ability to predict funding increased from 55% to 59% with the addition of the interaction items. This increase was significant at the p<.05 level. Therefore, these data indicate that image compatibility does moderate the relationship between decision outcomes and problem space perceptions.

Table 6.20
Regression Analysis for Perceived Image Compatibility and Problem Space

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.770[a]	.594	.492	19007.29

a. Predictors: (Constant), CI, MINI, LIKELY, RISK, IMPORT, RESP, SUNK, DISAP, IMAGE, CONTROL, MI, DI, LI, RE, II, SI, RI

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.59E+10	17	2110706028	5.842	.000[a]
	Residual	2.46E+10	68	361276981.5		
	Total	6.04E+10	85			

a. Predictors: (Constant), CI, MINI, LIKELY, RISK, IMPORT, RESP, SUNK, DISAP, IMAGE, CONTROL, MI, DI, LI, RE, II, SI, RI

b. Dependent Variable: AMT

Result: Regression Model $R^2 = 0.594$, $F = 5.842$, $p<0.000$.
Decision: **Reject the null hypothesis.**

The null hypothesis H_{07}, was concerned with determining the nature of the interaction between image compatibility and the group of eight problem space items. To test H_{07} the compatibility measure was split at the mean into two groups, a low compatibility group and a high compatibility group consistent with the approach employed by Dunegan, Duchon and Ashmos (1995, 36). The same regression method as used in testing H_{05} was applied to each of these groups, Table 6.21 and 6.22.

H_{08}: The perceptions of the problem space and decision outcomes will not be stronger when perceived image compatibility is low.

Table 6.21
Regression of Low Image Compatibility for Problem Space and Decision Outcomes

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.673[a]	.452	.337	19204.04

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, RESP, MINI, RISK, SUNK, IMPORT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.16E+10	8	1447691838	3.925	.002[a]
	Residual	1.40E+10	38	368794999.5		
	Total	2.56E+10	46			

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, RESP, MINI, RISK, SUNK, IMPORT

b. Dependent Variable: AMT

Result: Regression model for low image compatibility ($F = 3.868$, $p < .002$, $R2 = .485$)
Decision: **Reject the null hypothesis.**

Table 6.22
Regression of High Image Compatibility for Problem Space and Decision Outcomes

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.648[a]	.420	.265	17372.52

a. Predictors: (Constant), CONTROL, SUNK, RISK, RESP, LIKELY, MINI, DISAP, IMPORT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.55E+09	8	819194705.7	2.714	.022[a]
	Residual	9.05E+09	30	301804488.7		
	Total	1.56E+10	38			

a. Predictors: (Constant), CONTROL, SUNK, RISK, RESP, LIKELY, MINI, DISAP, IMPORT

b. Dependent Variable: AMT

Result: Regression model for high image compatibility ($F = 2.403$, $p < .036$, $R2 = .427$)

Decision: **Reject the null hypothesis.**

The first stage involved determining whether image compatibility added anything to the predictive power of the model used to test H_{04}, that is the predictive ability of problem space items. High and low image compatibility predicted the level of funding, contrary to expectations. However, when the image compatibility was low, the predictability in the variance increased by a higher percentage.

Additional Tests of the Data

The internal structure of the eight problem spaces was explored by a principal-component analysis with an orthogonal Varimax rotation. By specifying a minimum eigenvalue of 1.0, three factors were determined to be contributing significantly to the patterning of variables. These three factors accounted for 81.7% of the variance. The items and factor loadings for the three factors are shown in Table 6.23, which demonstrates that no commonalities or overlapping occurred between the factors identified by the principal- component analysis.

Table 6.23
Rotated Component Matrix

	Component		
	1 ~ Sunk Cost	2 ~ Accountability	3 ~ Risk
Sunk	**.854**		
Minimise *	***-.644**		
Intention	**.584**		
Importance		**.801**	
Control		**.661**	
Responsibility		**.651**	
Risk			**.830**
Disappointed			**.798**

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalisation.
Rotation converged in 5 iterations.
Cut off for components is .350
* The response scale for this item was reversed, therefore negative result indicates a positive correlation

The details of the component matrix for all three factors are presented in Table 6.23a in Appendix E. The prominent item in the Component 1 was sunk cost and combined with the other items in the factor suggested that the title "sunk cost" was an appropriate descriptor. As expected, the sunk cost was a major issue in the decision to commit to further investment in the project. Positive correlation with the amount of funds is an indication of sunk cost effect.

The combination of items in Component 2 was suggestive of a management style defined by items relating to personal feelings of importance, responsibility, and control. Accordingly, the term "accountability" appeared to be an appropriate descriptor for this factor. The person is responding to issues concerning the level of personal responsibility and locus of control over the events and professionals are trained to be accountable for their actions (Hansen & Mowen, 2000, 517; Taylor & Pincus, 2000, 359). That all three items were positively correlated is consistent with the notion that these are underlying drivers which combined would motivate a person to commit further funds to an investment.

The items in Component 3 were suggestive of the concept of the "risk" with combination of risk and disappointment. Accordingly, the term risk appeared to be an appropriate descriptor for this factor. This component was intuitively consistent with the notion of risk utility, with both the level of perceived risk and the level of disappointment in the progress of the project.

Separate descriptive statistics were computed for the data in each of the three framing conditions. The results are presented in Table 6.23b-6.23d in Appendix E. A brief examination of the tables indicates that only one problem space element (Intention) was significantly correlated with funding when the problem space was negative (Table 6.23b), while two problem space elements (Risk and Responsibility) were significantly correlated with funding when the frame was positive (Table 6.23c). In addition, only one problem space element was significantly correlated with funding when the problem space was negative and the sunk cost lower (Table 6.23d).

Conclusions

First, the granting of additional funds was significantly higher in Version "2" (positive frame) than in Version "1" (negative frame). This finding was contradictory to the predicted risk propensity of prospect theory. The interesting aspect of this result was that the positive frame produced a higher mean funding outcome than the negative frame, which implies that the positive frame elicited risk-seeking behaviour and the negative frame risk-averse behaviour contrary to the predictions of prospect theory.

Possible explanations for the contradictory results of the negative frame may be found in the concepts of, threat-rigidity (Staw, Sandilands & Dutton, 1981) and hypervigilance (Jannis & Mann, 1977). In the case of the contradictory results of the positive frame, attention to opportunities (March & Shapira, 1987), as discussed in Chapter 3, could provide an explanation.

Threat-rigidity and hypervigilance posit that poor financial performance – negative framed information - promotes risk-averse behaviour because perceived threats arouse stress and anxiety and decision makers are then more likely to respond in a conservative or protective manner, preferring to remain with the status quo (Palmer, Danforth & Clark, 1995). Conversely, attention to opportunities predicts that when information is framed in a positive manner, decision makers are more likely to exhibit risk-seeking behaviour because they perceive opportunities to arise from their good performance. These explanations appear to be more strongly consistent with the results in terms of the observed risk behaviour.

Second, when the amount of sunk cost was manipulated (reduced in the negative frame only), the provision of additional funds was higher in Version "3" (negative frame) than Version "2" (positive frame). This result suggests that the level of sunk cost acted as the reference point as predicted by prospect theory as outlined in Chapter 3. The findings also provide further evidence of the existence of the sunk cost effect.

Third, the perception of responsibility for the initial decision was found to exert an influence over the amount of funding provided. Staw and Ross (1978) predicted that responsibility for the initial decision would cause subjects to escalate their commitment as a form of justification that the initial decision was correct. The results support this theory since the level of responsibility was positively correlated with the level of funding provided and emerged as a significant factor on analysis.

Fourth, the results concerning the problem space tests were not consistent with previously reported findings. The results indicate that the positive-framed versions exhibit stronger cognitive relationships to the problem space perceptions than the negative-framed versions. This is incongruent with the findings of Dunegan, Duchon

and Ashmos (1995). They found that negative framing resulted in a stronger relationship to the amount of funding.

A number of possible explanations and observations are considered here. First, that negative framing did not elicit the expected cognitive behaviour may be due to the unexpected risk-avoidance exhibited in the negative-framed outcomes. The negative frame should cause decision makers to exhibit risk-seeking behaviour, which would be manifest in the mean of the funding being larger (not smaller) than the positive-framed version outcomes. Second, the additional information and modifications to the wording of the task may have been responsible. The respondents may have felt more certainty about the financial situation – in terms of attention to opportunities - resulting in the higher mean of funding in the positive framed version. The significantly higher amount of funding in the positive frame suggests that the information influenced characteristics of the cognitive modes (explained in terms of threat-rigidity and hypervigilance) exhibited by the subjects in their decision making. The next chapter further tests for this problem space anomaly.

The problem space items were also subjected to additional testing. When subjected to principal component analysis three distinct factors were identified, *sunk cost*, *accountability* and *risk*. The factors provide additional support for the findings of a sunk cost effect. The factor identified as *risk* by the principal component analysis also supports the proposition that risk behaviour is contingent or modified by risk perception (Sitkin & Pablo, 1992). The argument for the inclusion of the role of risk perception was discussed in Chapter 3 and Chapter 4.

Fifth, testing of image compatibility produced mixed results. Consistent with image theory, low image compatibility was a significant predictor of the level of funding. The unexpected finding was that high image compatibility was also a significant predictor of the level of funding. However, the statistical significance was lower than that of low image compatibility and the percentage increase in the R^2 was also less by comparison.

CHAPTER 7

The Effect of Framing and Problem Space on Outsourcing and Investment Decisions: An Investigation of the Perceptions of Accountants in Queensland

Chapter Abstract

Previous research on financial decision-making situations indicated that contextual aspects of financial information, such as framing, problem space and asset specificity influence the outcome. To assess the influence of these factors, a combination of outsourcing and research and development tasks were used to survey the perceptions of accountants. Survey 3 examined the effect of framing (positive/negative) on the inclusion of sunk and opportunity cost information across two types of decision tasks. Additional questions provided information about the risk perceptions and cognitive biases of the respondents, referred to as the "problem space". The respondents were also faced with information regarding asset specificity – the extent to which assets are inexorably tied to the specific project or outsourcing agreement.

In making the decision to outsource, the sunk cost effect, framing and asset specificity were found to be significant factors in influencing the decision outcome. In the investment decision, both sunk cost and the framing effect were found to be significant influences. A factor related to the sunk cost effect, escalation of commitment, significantly affected the allocation of funding in the investment task. The results did not follow the predictions of prospect theory; the reverse effect was found— in the negative frame, greater risk-avoidance was evident while in the positive frame, greater risk-taking was evident.

Background to the Research

The purpose of the research was to examine whether accountants follow the rational decision-making model when making financial decisions. A key issue was whether the "sunk cost effect" could be detected in the decisions made by accountants. The expectation was that accountants are less likely to be influenced by sunk cost information due to the nature of their education which explicitly deals with the relevant

costing approach to decision making. In addition, the expertise of accountants, combined with their educational background, was considered to provide an ideal setting to examine the influence of the "framing effect", as predicted by prospect theory. A comparison was made against the surveys of hospital managers and financial planners, as reported in Chapters 5 and 6.

To achieve a desirable level of compatibility with the prior decision-making research, accountants were asked to complete two tasks: an outsourcing decision task similar to the task undertaken by hospital managers and an investment decision task similar to the task undertaken by the financial planners. To maintain consistency in the application of the research, two separate sets of null hypotheses were developed. A unique identifier is used to distinguish between the two tasks: "T1" for the outsourcing task and "T2" for the investment task. The identifier is located at the end of each null hypothesis.

Rational Decision Making Models

According to the economic theory of rational decision making, individuals are rational actors as they are engaged in the process of optimising expected utility by selecting the highest payoff from available alternatives (March, 1988a; Majone, 1989; Rich & Oh, 2000). The assumption that decisions should be rational is implicit in the neo-classical economic theory of the "economic man" or the "rational man" (von Neumann & Morgenstern, 1944; Marsden, 1984; Provan, 1989; Boland, 1998). Rational actors do not necessarily examine all possible alternatives but may merely search until they find a solution that meets a certain acceptable level (satisficing) (March & Simon, 1958). This behaviour suggests that individuals try to be rational, but are bound by cognitive limitations. Simon (1979) distinguished between purely economic rational behaviour and functional behaviour, which he referred to as "bounded rationality", which recognises the cognitive limitations. Bounded rationality assumes that information is essential in allowing individuals to compare alternatives (March & Simon, 1958).

According to March (1988b, 386), the main reason for using information in rational decision making is to reduce uncertainty in making a choice from among a number of alternative courses of action. In decision models that promote the maximization of the individual's utility function, a lack of information is perceived as the reason for seemingly "irrational" decisions (Cook & Levi, 1990). Elster (1983) concluded that if

decision makers have insufficient information, rationality requires them to abstain from considering alternative courses of action. Tversky and Shafir (1992) provided support for existence of satisficing behaviour by demonstrating empirically that decision makers end their search for alternatives once they find one that provides a ready justification for the choice.

Rational Behaviour in Decision Making

Drawing on the notion of "rational behaviour", the rational disposition of the decision maker becomes an important variable in assessing the overall decision. A rational decision maker is expected to display behaviour that is consistent with risk-avoidance or risk-minimization. Intuitive decision making was considered to often lead to irrational choices (Bayoumi & Redelmeier, 2000).

Lee (1971) proposed that an appropriate means of describing "rational" behaviour when applied to an individual was by reference to a continuum of rationality. Duchon, Dunegan and Barton (1989) devised a self-assessment item based on this continuum. Consistent with this approach, subjects were asked to make a self-assessment of themselves as either rational or intuitive decision makers by responding to a seven-point Likert scale incorporated in the survey. Duchon, Dunegan and Barton (1989, 26) argued that the term "intuitive" was a more appropriate antithesis to rational than "irrational" because of the strong pejorative connotation associated with the word irrational. The first null hypothesis in this study tested whether the choices made by rational decision makers differ from intuitive decision makers.

> H_{01A}: There will be no difference in the outsourcing decisions made between people who perceive themselves as rational decision makers and those who perceive themselves as intuitive decision makers as measured by a Likert scale self assessment. [T1]

Risk Perception and Framing Effects

There is an argument (Kahneman & Tversky, 1979) that positive or negative (framing) of decision information may cause potential bias in the decision outcome (the framing effect). This proposition suggests that framing can alter the perception of risk and that negative framing invokes a strong tendency toward risk-seeking or risk-taking.

Therefore, how decision makers respond to the positive or negative framing of a problem task may be due to the perception of their own level of rationality in making decision. In this dissertation all subjects were assumed to be of a "rational" disposition due to their education and experience and more importantly because this is the view espoused by normative theory.

Research has shown that individuals are influenced by the way in which information is presented (Kahneman & Tversky, 1979). A frame, according to Beach (1990, 23), is *"a mental construct consisting of elements and the relationship between them that are associated with a situation of interest to a decision maker."* The frame may therefore be thought of in terms of a representation of a situation through which a decision maker gains understanding or makes sense of the alternative courses of action available. Decision makers are predicted to be risk-averse in situations involving gains, but risk-seeking when the same situation is framed in terms of losses (Kahneman & Tversky, 1979). One explanation is that when a decision maker focuses on the negative, there is a greater urgency to engage in preventative behaviour rather than explore other options. March and Shapira (1992) suggested that individuals become more survival oriented when focusing on losses which threaten to deplete their resources and are more aspiration oriented when focused on gains.

The basis for considering the framing effect as an influence in decision making can be traced to Kahneman and Tversky (1979). Framing effects are reported in the literature of behavioural decision and negotiation fields (Mellers, Schwartz & Cooke, 1998; Neale & Bazerman, 1991; Camerer, 1995) and the attitude-change field (Cialindi, 1988; Eagly & Chaiken, 1993). The assumption that decision makers are likely to be influenced by the positive or negative framing of alternative choices suggested the following null hypotheses for Survey 3.

H_{o2A}: The decision to outsource will not differ between responses due to framing of the version. [T1]

H_{o1B}: The amount of funding provided will not differ between responses due to framing of the version. [T2]

These null hypotheses test the existence of framing effects in the outsourcing task and the investment task.

Issues of Relevant Costs in Decision Making

Relevant costs and relevant revenues are defined as *"those expected future costs and expected future revenues that differ among the alternative courses of action being considered*" (Horngren, Foster & Datar, 2000, 378). There are two key elements worth noting in this definition of relevant costs and revenues. First, the costs and revenues must occur in the future. The argument is consistent with normative model of rational decision making: that nothing can be done about the past and every decision deals with selecting a course of action for the future. Second, relevant costs and revenues must differ among the alternative courses of action. The argument in this instance is that if the costs and revenues do not differ, then there is no rational economic basis for determining a difference between the alternative course of actions.

Opportunity Costs

Opportunity costs are considered relevant to make or buy decisions, also referred to as outsourcing decisions (Burch & Henry, 1970). The proposition that individuals act rationally and always select the optimal alternative implies that if an opportunity cost exists in the choice between alternatives, rational decision makers will include them in their analysis. Opportunity costs are defined generally as *"those benefits which could have been received had an alternative course of action been chosen"* (Thompson, 1973, 263) and in management accounting text books as the *"maximum available contribution to profit that is forgone (rejected) by using limited resources for a particular purpose"* (Horngren & Foster, 1991, 374). There is a further assumption that all opportunity costs are known to decision makers (perfect information).

The extent to which decision makers are able to distinguish between implicit opportunity costs, as distinct from explicit opportunity costs was the subject of the research by Roodhooft and Warlop (1999). In the case of explicit opportunity costs, the information is provided in an unambiguous manner. That is, the details of the opportunity cost are stated as being relevant to one of the alternatives being considered. In contrast, when information is ambiguous, the opportunity cost is considered to be implied or implicit. Roodhooft and Warlop's (1999) findings suggest that decision makers may miss or underweight the importance of implicit opportunity costs. This conclusion is consistent with the findings of Becker, Ronen and Sorter (1974), Friedman

and Neumann (1980), Hoskin (1983), and Northcraft and Neale (1986) that individuals only include opportunity costs when explicit information is provided.

Sunk Costs

Sunk costs are by definition past costs that are unavoidable and are deemed irrelevant to decision making because they can not be changed (Horngren, Foster & Datar, 2000, 379). According to economic and accounting theory only incremental costs, not sunk costs, should influence decisions. In a make or buy analysis, past investments are deemed to be irrelevant. There is evidence that managers tend to include irrelevant costs, such as sunk costs, into their decision making information; thus there exists what is known as the "sunk cost effect". Research into the sunk cost effect demonstrated that individuals are inclined to be influenced by past costs (Arkes & Blumer, 1985). Even though sunk costs may be irrelevant from an accounting perspective, the decision maker (regardless of experience) is likely to be influenced by the knowledge that sunk costs exist. Staw (1976) and Whyte (1991) found that the sunk cost effect was more likely to occur when the decision maker felt personally responsible for any negative consequences resulting from the decision.

It was hypothesised in Survey 3 that the perception of negative consequences will be more significant in the negative frame than in the positive frame. This assumption, together with the prior research findings, led to the development of the following hypotheses to be tested in this study:

H_{o4A}: The decision to outsource will not be reduced by the presence of past investment (sunk costs). [T1]

H_{o2B}: The amount of funding will not be reduced by the level of past investment (sunk costs). [T1]

These null hypotheses test the existence of the sunk cost effect.

Asset Specificity

According to the theory of transaction cost economics, the degree of asset specificity is an important consideration in making outsourcing decisions (Chalos, 1985). Investments that can not be used for any other purposes and have no alternative value are asset specific to the particular option. Conversely, investments that can be used for other purposes are not asset specific. The requirement to invest in an asset that is

specifically to be used for the duration of the outsourcing agreement was expected to have a negative impact upon the decision to outsource. Outsourcing is only desirable when expected governance and coordination costs, which result from asset specific investments, are lower than the production cost advantage of an external supplier (Chalos, 1995). Asset specificity may be interpreted as another form of sunk cost; that is a cost that will become sunk as a result of the present choice and led to the following hypothesis:

H_{o3A}: The decision to outsource will not differ due to asset specificity in the version.[T1]

This null hypothesis tests the role of asset specificity in the outsourcing decision.

Contextual Factors Influencing Decisions

Escalation of Commitment as a Responsibility Factor

Extensive research demonstrated that individuals who made the initial decision are more likely to make further decisions in a biased way to justify their earlier decision (Staw & Ross, 1978; Teger, 1980; Bazerman, Beekun & Schoorman, 1982; Bazerman, Guiliano & Appleman, 1984; Brockner & Rubin, 1985; Schoorman, 1988). Staw (1976, 1981) found that individuals tend to escalate commitment to previous decisions, even if the behaviour is not consistent with the model of rational behaviour. A consequence is that resources are committed to justify previous actions whether or not the rationale for those initial commitments is still valid. It was surmised that the extent of commitment to escalation may be due to the perceived degree of responsibility or ownership of the original decision to invest in the project. This assumption led to the following null hypothesis:

H_{o3B}: The amount of funding will not be different between respondents due to their perceived level of responsibility for the initial decision. [T2]

This null hypothesis tests whether personal feelings of responsibility act as a contributing factor to escalation to commitment. This null hypothesis is also concerned with the possible influence of the level of perceived responsibility for the initial decision to invest and the amount of additional funding to be provided.

Verbal Probabilities and Framing Effects

Teigen and Brun (1995) examined verbal probabilities, which are phrases that express different levels and varieties of probability and uncertainty. For example, terms such as "perhaps", "possible", "doubtful" and "not certain". They found that these linguistic expressions could be divided into two distinct categories: those referring to the occurrence and those referring to the non-occurrence of a targeted outcome. The implications of these verbal and numerical probabilities were identified in a variety of decision-making contexts (Fischhoff & De Bruin, 1999; Larichev & Brown, 2000). Teigen and Brun (2000) and Teigen (2001) found that individuals interpret verbal and numerical probability estimates differently. Teigen and Brun (2000) concluded that the direction of numerical probabilities— as distinct from verbal phrases— is context dependent as well as biased towards a positive interpretation. These findings suggest that different framing effects may be elicited through the use of verbal probabilities. This led to the development of the following null hypothesis:

> H_{04B}: The amount of funding will not differ between investment versions due to the provision of explicit details. [T2]
>
> This null hypothesis tests the degree to which the presentation and manipulation of information may impact upon the framing effect.

This matter was of interest due to feedback from pretesting the survey instruments and also the concern that too much information influences the respondent's perception of the problem space.

Problem Space and Framing Effects

The role of cognition is well documented as a salient factor in decision making (for example; Newell & Simon, 1972; Lord & Maher, 1990). The information processing system refers to the individual's cognitive model of problem-solving behaviour (Newell and Simon 1972) and the task environment refers to the problem itself. The problem space refers to the internal representation of the task used by an individual (Payne, 1980, 95). The concept of problem space provides further insights into the differences between choices made by respondents (Payne, 1980). The inclusion of problem space in decision research may provide better understanding of behaviour anomalies related to risky choice. Kahneman and Tversky (1979) suggested these anomalies may be due to

the manner in which the problem is coded, edited and represented by the decision maker. These issues are linked with the problem space construct.

Dunegan (1993) examined the influence of framing on the processes that are thought to proceed the eventual actions of a decision maker. He called for more research on the extent to which framing effects influence cognitive processes, in particular, the processes that result in perceptions about conditions regarding the decision (Lord, 1985; Bowen, 1987). The way in which a decision maker processes information can be measured by the cognitive perception of the problem space (Maheswaran & Chaiken, 1991; Louis & Sutton, 1991; Fazio, 1990; Langer, 1989; and Isen, 1984). The use of problem space was consistent with the theoretical model developed in Chapter 4.

When controlled modes of cognitive processing are used, information is subjected to a more comprehensive, deliberate and thorough analysis. When automatic modes are used, the processing of information is limited and there is a reduced attention to detail with fewer incoming cues creating a cognitive representation of the task (Dunegan, 1993). Controlled processing is expected to produce a significant relationship between problem space measures and decision outcomes (funding) because problem space should be more easily recalled and used in the controlled mode. In the automatic mode, the problem space is not easily recalled for conscious use and the relationship between problem space and decision outcomes should be weak or insignificant. Two hypotheses were raised:

$H_{o5B:}$ The perceptions of the problem space will not differ between versions due to the framing effect. [T2]

This null hypothesis tests whether framing produces different results in different perceptions of the problem space.

$H_{06B:}$ The eight problem space variables will not significantly explain the variance in funding. [T2]

This null hypothesis tests whether different perceptions of the problem space due to framing produces different decision outcomes.

Data Collection

Target Population and Sample Selection

The target population was selected from the category Accountants in the Australian Yellow Pages Telephone CD Rom 1999 edition. A number of stages were involved in developing the database for the sample population. As accountants in public practice are subject to the same standards across Australia, the issues raised in the survey should be relevant to all accountants, no matter which state in Australia they were situated. Therefore, the search was restricted to Queensland accountants; a total population of 2116 was identified. Where the actual population is known, the statistical method for determining an appropriate sample size can be employed. In this case the appropriate sample size was determined to be 327 (N=2200 s= 327) (Leedy, 1997, 211). Second, a sample of 600 was randomly selected from this population. Third, a sample of 100 was randomly assigned to each of the six versions of survey instruments. The selection of the larger sample size of 600 allowed for an equal distribution over the six separate versions and better representation to address possible sampling bias. Following the initial mail out of surveys, 14 were returned with the notification that the address was no longer correct. This reduced the sample population to 586. A total of 237 responses were received. The overall response rate of 39.5% was considered satisfactory for the size of the sample and population.

Validity and Reliability

A goal of questionnaire design is to collect information with maximum reliability and validity (Alreck & Settle, 1985; Fowler, 1988). The development of the survey from the literature and pretesting were used as a means to address adequate coverage of the subject matter as well as providing for internal and content validity. To be able to generalise to a particular population, the information must have external validity. Random sampling was used to assure that the sample was representative of the population. In this study, the appropriate population was identified and a random sample was derived using the procedures suggested by Kerlinger (1986).

Reliability of a survey questionnaire depends on the degree to which the instrument provides consistent results (Kerlinger, 1986). The method most commonly used is the split-half procedure. This involved checking the results from one half of the responses

against the other half. Recommendations to improve response rate were used in this study: short simple wordings, cover letter, incentive to return the survey for a report and to avoid follow up, confidentiality, telephone fax and email contact (Sekaran, 1992, 201; Emory & Cooper, 1991, 334; Berdie, Anderson & Niebuhr, 1986, 42). The instrument was kept to two pages to minimise the amount of time required, as well as administrative procedures in conformity with the suggestions of Frazer and Lawley (2000, 79).

Survey Instruments

Each survey instrument contained two different tasks. The first task concerned an outsourcing decision of which four versions were used. The second task concerned an investment decision pertaining to a research and development project. There were six versions of this task used. The survey instruments also differed in details regarding the explicit or implicit nature of sunk costs.

Task 1 ~ Outsourcing

The first task was based on outsourcing decisions (Roodhooft & Warlop, 1999), framing effects (Kahneman & Tversky, 1979) and self-evaluation questions (Northcraft & Neale, 1986; Duchon, Dunegan & Barton, 1989). The task was derived from a simple exercise presented in Langfield-Smith, Thorne and Hilton (1998, Ex16.35). This exercise was extended and developed to include aspects of sunk cost consistent with the outsourcing task. The task involved a choice between outsourcing or continuing the operations of the payroll function of an insurance company. The annual cost associated with operating the payroll department was $133,000— all identified as avoidable costs— while the submission for external payroll services was $134,000 annually fixed for three years. From this perspective, the outsourcing is not a rational choice.

Additional information provided details of an opportunity cost pertaining to the alternative use of floor space and a sunk cost with regard to office furniture and equipment. Under the rational decision-making model, the inclusion of the opportunity cost from the alternative use of the floor space— a saving of $1,900 per year— should lead to the decision to outsource. The inclusion of the saving in the evaluation of the relevant costs reduces the annual cost of the outsourcing option to $132,100 ($134,000 -

\$1,900 = \$132,100). With the identification of relevant costs, the outsourcing option is the rational choice.

A further opportunity cost was associated with the sale of office furniture and equipment, which was stated as costing \$30,000 to acquire and the wording was manipulated to produce a framing effect. The negative frame was presented as a loss *("will result in a \$20,000 loss on disposal")* while the positive frame was presented in terms that refer to the attainment of cash *("will realise \$10,000 on disposal")*. In either case, the net result was the same— the office furniture and equipment on disposal would realise \$10,000 cash resulting in a \$20,000 loss.

To test the relevance of the sunk cost and the framing effect, all reference to sunk cost was deleted in the third and fourth versions of this task. In the fourth version, an investment was required for equipment to process the pay slips. The amount of \$500 was not enough to change the overall financial benefit in favour of outsourcing. This asset, however, could not be used by the firm nor by any other payroll provider and had no resale value. The investment was asset specific to the outsourcing option.

The subjects were asked to rate their attitude to the outsourcing of the payroll function on a seven point Likert scale anchored as 1 (Very Negative) and 7 (Very Positive). Having made this self-assessment, the subjects were then asked to make a choice to either outsource or continue the internal payroll function. The next question asked the subjects how sure they were of this decision, based on a seven point Likert scale anchored as 1 (Certain it should be Internal) and 7 (Certain it should be External). For additional insight into the cognitive perceptions which were likely to influence the decision making, subjects were asked whether they considered themselves (in general) to be a rational decision maker or an intuitive decision maker. A seven point Likert scale anchored as 1 (A Rational Decision Maker) and 7 (An Intuitive Decision Maker) was used. Duchon, Dunegan and Barton (1989, 26) argued that the term "intuitive" was a more appropriate antithesis to rational than irrational, because of the strong pejorative connotation associated with the word "irrational".

Four versions of task one were presented to subjects and were distinguished according to (1) the existence of a positive frame, (2) the existence of a negative frame, (3) the

absence of sunk cost and no frame, and (4) the absence of sunk cost, no frame and additional asset. The variables are summarised in Table 7.1 below:

Table 7.1
Summary of Variables for Task One (Outsourcing Decision)

Variable Category	*Number*	*Details*
Treatment Effect: (Treatment Variables)	Three	Framing (positive vs negative vs nil) Sunk cost vs no sunk cost, Asset specific investment.
Demographic Variables: (Independent Variables) [Predictors]	Three	Attitude to Outsourcing Decision. Certainty of Decision. Rational vs Intuitive Decision style.
Dependent Variables: (Criterion Variables)	Two	Choice A – Internal (Make) Choice B – Outsource (Buy)

Task 2 ~ Investment Project

The second task was based on research by Dunegan (1993). The task relates to a Research and Development Manager, who having instigated a project in the past, is confronted with a request for additional funds for that project by the team responsible for the continuance of the project. The team is seeking an additional \$100,000, as the project is behind schedule and over budget. The R&D manager has \$500,000 in unallocated funds; however these funds may be required for other projects and there is some time before the end of the current financial year. The subjects were instructed that the manager believes there is a fair chance the project will not succeed. The final statement given to the subjects was the pertinent framing effect. The positive frame stated that, *"Of the projects undertaken by this team, 30 of the last 50 have been successful"*, while the negative frame differed with respect to the last part of the statement *"Of the projects undertaken by this team, 20 of the last 50 have been unsuccessful"*. Note that in both tasks, the ratios are the same.

Pilot Testing

Pilot testing of the instrument provided feedback that pointed to the lack of enough specific details with comments that the details were insufficient or too vague to allow a valid decision. After considering the implications of alternatives for the details, an e-mail was sent to Professor Dunegan seeking confirmation regarding the vagueness of the details in the original task. Dunegan advised that the task was deliberately vague in order to elicit a more relevant response on the perceptions under the problem space items. Maintaining the focus of the subjects on their decision-making process was

achieved by such vagueness. However, there was the risk that some subjects might perceive the task as incomplete or ill-defined in comparison to real world situations and therefore would not treat the matter with any level of seriousness. These concerns were based on comments raised in the pretesting.

To test whether additional information would make a difference to the outcome of this research, changes were made in key areas identified by the pretesting. The actual sunk cost of the initial investment was identified as \$400,000; this was considered a significant enough amount to influence the subjects. The \$100,000 requested now represented one quarter of this sunk cost. With regard to the actual time remaining until the end of the financial year, a time frame of 6 months was considered to represent a challenge to the subject's perception of risk. The subjects could view the 6 months as half the year gone or half the year remaining (Dunegan, 1993). The original task used the term "fiscal year"; the more common term in use in Australia is "financial year"—the terminology was amended to maintain relevance in the Australian setting.

A further issue concerned the use of the term "fair" which was applied in describing the evaluation of the situation " *... you believe there is a fair chance the project will not succeed"*. The term "fair" was considered to imply that the chance referred to in the task was 50% or more. The alternative term "moderate" was viewed as implying that the chance was 50% or less and likely to influence the decision-making process. Allowing for the suggested changes, six versions of the task were used in the research. The first two versions were based on the original research with modifications to Australian conditions. These versions maintained the vagueness and differed only in the positive and negative framing. The second two versions were changed to include all the suggested modifications and otherwise differed only in the positive and negative framing.

To test the relevance of the reference point (sunk cost information), these modifications followed the suggestions of Professor Dunegan. In order to test a lower amount of sunk cost, two additional versions were developed. A fifth version using a positive frame, expanded wording and a lower amount of sunk cost (\$100,000 rather than \$400,000) was employed; directly comparable to the second version. A sixth version using a negative frame, expanded wording and a lower amount of sunk cost (\$100,000 rather

than $400,000) was directly comparable to the fourth version. The variables for task two are summarised in Table 7.2

Table 7.2
Summary of Variables for Task Two (Investment Decision)

Variable Category	*Number*	*Details*
Treatment Effect: (Treatment Variables)	Three	Framing (positive vs negative) Reference point (positive vs negative) Detailed information (sunk cost – specified or not) (sunk cost – high or low) (time remaining in financial year) (fair vs moderate – chance)
Demographic Variables: (Independent Variables) [Predictors]	Two	Problem space inventory. Rational vs Intuitive Decision style.
Dependent Variables: (Criterion Variables)	Two	Choice to provide NIL funds Choice to provide a level of funds

Non-Response Bias

The likelihood of non-response bias was assessed using late responses as a proxy for non-response and compared with early responses. The early versus late responses were tested using two different methods due to the nature of the data. A chi-square test was conducted for Task One; the results were not significant χ^2 0.139 (α =0.710, df = 1), Table 7.3.

Table 7.3
Analysis of Early/Late Responses ~ Task One Outsourcing Decision

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.139[b]	1	.710		
Continuity Correction[a]	.048	1	.826		
Likelihood Ratio	.139	1	.709		
Fisher's Exact Test				.762	.415
Linear-by-Linear Association	.138	1	.710		
N of Valid Cases	237				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.22.

For Task Two, the data was a mixture of ordinal and nominal. Testing early/late responses was conducted using the SPSS "Ordinal Regression" which produced a chi-

square of the model fit, χ^2 52.443 (α =0.457, df = 52), Table 7.4. An independent samples t-test was also conducted to test the equality of the means for each variable, Table 7.4a in Appendix F. Only the problem space item "Importance of the decision" was significantly different between early and late responses. Even though there was a difference in one variable, this was not deemed to be a major limitation as the number of late responses was not a high percentage of the overall responses. The results of the early/late responses suggest that the non-response bias was not to a threat to validity.

Table 7.4
Analysis of Early/Late Responses ~ Task Two Investment Decision

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	272.090			
Final	219.647	52.443	52	.457

Link function: Logit.

Data Analysis

Nominal or categorical measurement was used to classify the variables in the decision to outsource. For example, internal production "1" is a separate category from outsourcing "2". The method of statistical analysis most commonly recommended for use with nominal coded data is the chi-square test (Sproull, 1995, 68; Huck, Cormier & Bounds: 1974, 216; Isaac & Michael: 1990, 177). The data derived from the investment project decision was a combination of nominal, ordinal and interval measurements. This mix of data allowed for more robust statistical analysis and a wider variety of methods applied.

Results ~ Task One Outsourcing Decision

Four null hypotheses were generated with regard to the outsourcing decision task. These called for the use of a chi-square test on all the null hypotheses. The results and their interpretation are discussed below.

The only differences in the versions of the task was the framing of the amount to be realised from the disposal of the asset (office furniture and equipment) specific to the payroll department. The task details are summarised in Table 7.5. In each version, the

total cost of outsourcing was less than the cost of internal production and as such the economic rational choice was to select the option with the minimum cost. The expected result was that respondents would select the option to outsource based purely on the relevant financial data presented.

Table 7.5
Summary of Task One Details for Outsourcing Decision (N=237)

Version	*Make option*	*Outsource (buy) option*
A	Production cost: $ 133,000 Sunk investment: $ 30,000	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a. $10,000 Revenue from sale of asset (one-off framed as $10,000 revenue on disposal)
B	Production cost: $ 133,000 Sunk investment: $ 30,000	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a. $10,000 Revenue from sale of asset (one-off framed as $20,000 loss on disposal)
C	Production cost: $ 133,000 Sunk investment: Nil	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a.
D	Production cost: $ 133,000 Sunk investment: Nil	Purchase price: $ 134,000 Opportunity Costs: $ 1,900 Rent saving p.a. Asset Specificity: $ 500 pay slip machine.

The results of the survey were consistent with the expectations gained from the literature and prior research. Table 7.6 presents the percentage of respondents who selected the option to outsource for each of the two survey instruments. In the negative-framed version, the majority of respondents rejected the outsourcing option (60.2%). For the positive-framed version, the majority of respondents selected the outsourcing option (82.6%). In the version with no sunk cost and no framing manipulation, 80.0% of respondents selected the outsourcing option. In the version with an asset specific investment, no sunk cost and no framing manipulation, 57.6% of respondents selected the outsourcing option.

Table 7.6
Percentage of Respondents Selecting the Outsourcing Option (N=237)

Version	*Make*	*Outsource*	*Details*
A (n=83)	60.2%	**39.8%**	Sunk Cost & Negative Frame
B (n=86)	17.4%	**82.6%**	Sunk Cost & Positive Frame
C (n=35)	20.0%	**80.0%**	No Sunk Cost & No Frame & NATC
D (n=33)	42.4%	**57.6%**	No Sunk Cost & No Frame + ATC

NATC = No Anticipated Transaction Cost ~ ATC = Anticipated Transaction Cost (Asset Specific)

Hypothesis Testing of Rational Decision Makers

The null hypothesis is repeated below.

> H_{01A}: There will be no difference in the outsourcing decisions made between people who perceive themselves as rational decision makers and those who perceive themselves as intuitive decision makers. [T1]

In order to test this null hypothesis, the responses were sorted into categories. First, respondents who had self-evaluated themselves as a 1 or 2 on the Likert scale were at the higher level of the rational scale and allocated to the category "rational". Conversely, respondents who had self-evaluated themselves as 6 or 7 on the Likert scale were at the higher level of the intuitive scale and allocated to the category "intuitive". This effectively removed those respondents who did not consider themselves as either strongly rational or strongly intuitive. The number of responses was reduced to 56 for "A" (49 rational & 7 intuitive), 51 for "B" (44 rational & 7 intuitive), 25 for "C" (20 rational & 5 intuitive) and 22 for "D" (17 rational & 5 intuitive). There was a high proportion of respondents who perceived themselves as rational. These results were expected from a professional group such as accountants who are trained to be rational decision makers.

A chi-square test was performed for each of the versions to determine whether or not the observations were significant. Table 7.7 presents the results of the 2 x 2 contingency table. To test the relationship in each of the different versions, a chi-square test was conducted for each separately. The results for these are contained in Appendix F as Tables 7.7a. 7.7b, 7.7c, 7.7d and 7.7e.

Table 7.7
Crosstabulation of Outsourcing Decision * Sunk Cost High/Low

	Outsource		
	No	Yes	Total
Rational	45	85	130
Intuitive	8	16	24
Total	53	101	154

Result: χ^2 sample = 0.015 (α =0.903, df = 1)
Decision: **Cannot reject the null hypothesis.**
Computed χ^2 does not exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

The findings are summarised below.

- There was a **significant difference** in the decision to outsource between rational and intuitive decision makers in version "A" of the survey.
- There was no significant difference in the decision to outsource between rational and intuitive decision makers in version "B" of the survey.
- There was a **significant difference** in the decision to outsource between rational and intuitive decision makers in version "C" of the survey.
- There was a **significant difference** in the decision to outsource between rational and intuitive decision makers in version "D" of the survey.

The findings are summarised in Table 7.8 below.

Table 7.8
Summary of Differences Between Rational & Intuitive Decision Makers

Version	χ^2	*df*	α	*Reject / Accept*
A	8.711	1	0.003	∴ reject the null hypothesis.
B	2.208	1	0.137	∴ cannot reject the null hypothesis.
C	4.640	1	0.031	∴ reject the null hypothesis.
D	3.891	1	0.051	∴ reject the null hypothesis.

Hypothesis Testing of Framing

To test this null hypothesis, the versions A (negative frame) and B (positive frame) were compared using a 2 x 2 contingency table.

H_{o2A}: The decision to outsource will not differ between responses due to framing of the version. [T1]

A chi-square test was used to determine whether there was a significant difference between responses to the positive and negative-framed versions. Details of the statistical tests are shown in Table 7.9a in Appendix F.

Table 7.9
Crosstabulation of Decision to Outsource

AB * OUTSRC Crosstabulation

Count

		OUTSRC		
		1	2	Total
AB	1	50	33	83
	2	15	71	86
Total		65	104	169

Result: For the sample "A vs B", the obtained $\chi^2 = 32.688$, df = 1, was significant at α =0.000.

Decision: The **null hypothesis was rejected.**

The intention to outsource significantly differs between versions where the opportunity costs were framed either positively or negatively. This confirms that the framing effect did impact on the decision outcome. Further tests were carried out to examine the difference between versions "A" and "B" compared to the version with no frame "C". A 2 x 2 contingency table was developed to test each of these. Details of the statistical tests are shown in Table 7.10a in Appendix F.

Table 7.10
Crosstabulations of Outsourcing "A" and "C"

AC * OUTSRC Crosstabulation

Count

		OUTSRC		
		1	2	Total
AC	1	50	33	83
	3	7	28	35
Total		57	61	118

Result: For the sample "A vs C" the obtained $\chi^2 = 15.965$, df = 1, was significant at $\alpha = 0.000$.
Decision: The **null hypothesis was rejected.**

There was a significant difference in the intention to outsource between the negative-framed version and the version with no frame. Details of the statistical tests are shown in Table 7.11a in Appendix F.

Table 7.11
Crosstabulations of Outsourcing "B" and "C"

BC * OUTSRC Crosstabulation

Count

		OUTSRC		
		1	2	Total
BC	2	15	71	86
	3	7	28	35
Total		22	99	121

Result: For the sample "B vs C" the obtained $\chi^2 = 0.109$, df = 1, was not significant at $\alpha = 0.741$.
Decision: The null hypothesis cannot be rejected.

These findings are consistent with the expected framing effect predicted by prospect theory, in particular that positive and negative framing produces different responses to outsourcing versions that were identical except for the framing.

Hypothesis Testing of Sunk Cost

The versions relevant to test hypothesis H_{o3A} were "A" and "B" compared to "C". The null hypothesis is repeated below.

> H_{o3A}: The decision to outsource will not be reduced by the presence of past investment (sunk costs). [T1]

This null hypothesis was tested by comparing the responses to versions "A" and "B", sunk cost present, against those of version "C", with no sunk cost. Details of the statistical tests are shown in Table 7.12a in Appendix F.

Table 7.12
Crosstabulations of Outsourcing "A" and "B" vs "C"

ABVC * OUTSRC Crosstabulation

Count

		OUTSRC		
		1	2	Total
ABVC	1	65	104	169
	2	7	28	35
Total		72	132	204

Result: For the sample "AB vs C" the obtained $\chi^2 = 4.327$, df = 1, was significant at α =0.038.

Decision: The **null hypothesis was rejected.**

This result is consistent with the existence of the sunk cost effect.

Hypothesis Testing of Asset Specificity

The versions relevant to test hypothesis H_{o3A} were C compared to D. The null hypothesis is repeated below.

> H_{o4A}: The decision to outsource will not differ due to asset specificity in the version. [T1]

Details of the statistical tests are shown in Table 7.13a in Appendix F.

Table 7.13
Crosstabulations of Outsourcing "C" and "D"

CVD * OUTSRC Crosstabulation

Count

		OUTSRC		Total
		1	2	
CVD	3	7	28	35
	4	14	19	33
Total		21	47	68

Result: For the sample "C vs D" the obtained $\chi^2 = 4.001$, df = 1, was significant at $\alpha = 0.045$.

Decision: Therefore, the **null hypothesis was rejected.**

This result is consistent with the theory of transaction cost economics that asset specificity will have a negative influence over a decision to outsource.

Summary of Results ~ Task One Outsourcing Decision

There are four key points arising from the results of Task One with the outsourcing decision. First, rational decision makers did differ from intuitive decision makers in their decision to outsource. For the combined versions, the results were inconclusive. When the four versions were analysed individually, "A" and "C" were significantly different, "D" was considered significantly different at $\alpha = 0.051$, however, "B" was not significantly different. A possible explanation may lie with the framing effect of version "B". The positive frame may have negated differences between rational and intuitive decision making styles. The results suggest that the decisions of the rational decision makers were more closely associated with those of intuitive decision makers under the positive frame rather than under the negative frame.

Second, the decision to outsource was significantly different between positive- and negative-framed versions of the task. For versions "A" against "B", the results were inconclusive. When the framed versions were compared to the neutral version, "A" against "C" was significantly different, however, "B" against "C" was not significantly different. A possible explanation may be the sunk cost effect. Version "C" had no frame and no sunk cost while version "B" had a positive frame and a sunk cost. Under prospect theory, a positive frame was expected to induce risk-averse behaviour— this was not observed. The results clearly indicated that the decision to outsource was significantly higher in the positive frame with a sunk cost than in the negative frame

with a sunk cost. This finding is contrary to the risk-taking behaviour predicted to occur by prospect theory in tasks with a negative frame. In addition, the difference between versions "B" and "C", which contained no frame and no sunk cost, was not significant.

Third, in accordance with transaction cost theory, the decision to outsource was found to be influenced by the presence of an asset specific investment. Inclusion of an asset specific investment was not expected to have any significant influence on the decision by accountants. However, the results confirm that there was a distinct impact upon the outsourcing decision— this suggests that accountants are not immune from the effects of asset specificity.

Fourth, the decision to outsource was significantly different between versions with sunk cost and the version with no sunk cost. This provides confirmation of the sunk cost effect. The negative-framed version "A" was significantly different from version "C". However, when version "B", which had a sunk cost and a positive frame, was compared to version "C", with no sunk cost and no frame, the difference was not significant.

Results ~ Task Two Investment Project Decision

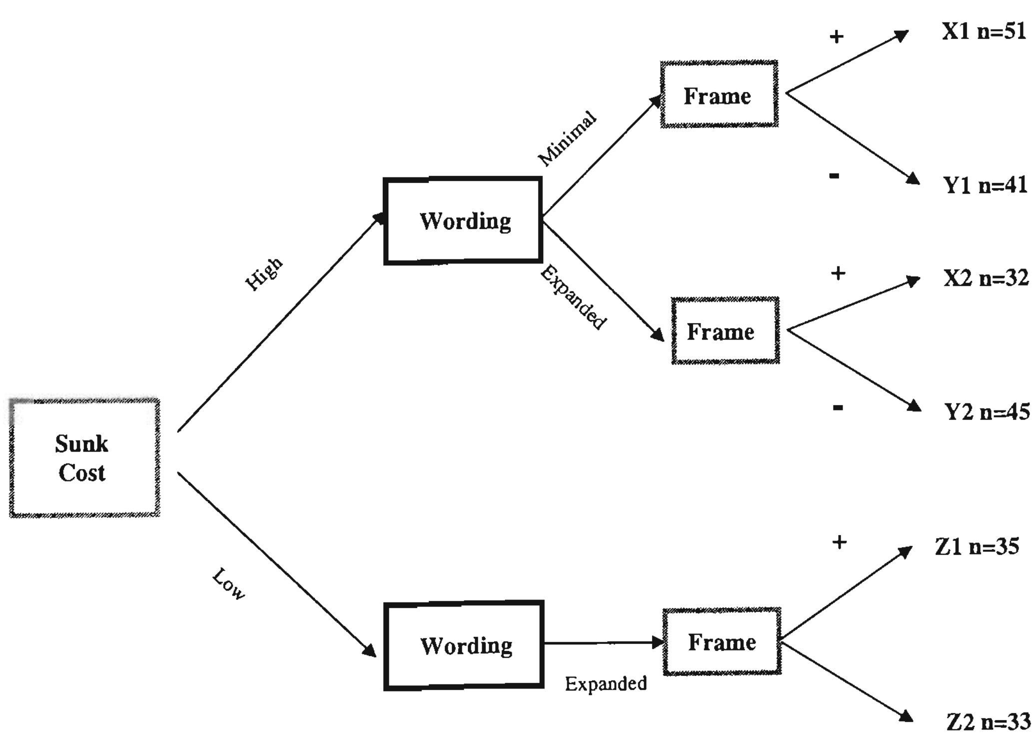
Five null hypotheses were generated with regard to the investment project task. These called for the use of a t-test (for null hypothesis 1), an ANOVA (for null hypotheses 1, 2, 3 and 5) and a chi-square test (for null hypothesis 4). A principal components factor analysis was conducted as an additional test on the data regarding the perceptions of problem space. Application of the investment project decision task to the accountants in public practice is consistent with the call by Duchon, Dunegan and Barton (1989) for research to be conducted on "real decision makers". The manipulations to the versions were based upon the suggestions by Duchon, Dunegan and Barton (1989) to manipulate sunk costs and by Dunegan (1993) to test a manipulation on terminology. The manipulations to the versions are summarised in Table 7.14.

Table 7.14
Summary of Task Two Details for Investment Decision (N=237)

Version	*Wording*	*Framing*
X1 (n=51)	Minimal	Positive
X2 (n=32)	Expanded	Positive
Y1 (n=41)	Minimal	Negative
Y2 (n=45)	Expanded	Negative
Z1 (n=35)	Expanded & Reduced Sunk Cost	Positive
Z2 (n=33)	Expanded & Reduced Sunk Cost	Negative

To better illustrate the differences between the six versions of task 2, a diagrammatic overview is presented in Figure 7.1. The figure shows the different levels of manipulation that distinguish the six versions. The sunk cost variable has two different levels— high and low— the variable "wording" has two levels— minimal and expanded— and finally the variable "frame" has two levels— positive and negative.

Figure 7.1
Comparison of Investment Decisions



Hypothesis Testing of Framing

Research on the effect of framing of decisions concerning resource allocation suggested that more funds are likely to be allocated in versions with positive framing than in versions with negative framing (Bateman & Zeithami, 1989; Dunegan, 1993). This is consistent with prospect theory. Testing involved framing (dummy coded 1 or 2) as the independent variable and funding (or resource allocation from $0 to $100,000) as the dependent variable.

> H_{01B}: The amount of funding provided will not differ between responses due to framing of the version. [T2]

A *t* test was performed comparing funding levels to determine whether the manipulation of the team's past record had any effect. The funding allocations were significantly different ($t = 6.501$, $p < .001$), with means of $33,837 for negative frame and $68,373 for the positive frame. This test established the existence of a framing effect.

To test the difference between the experimental conditions (decision choices versus positive and negative frames), an analysis of variance for repeated measures was performed. Since each of the four groups was treated identically, except for framing; differences were expected among them. The multiple comparison table, Table 7.15a, is in Appendix F.

Table 7.15
ANOVA for Framing of All Groups

ANOVA

AMOUNT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.43E+10	5	1.285E+10	12.580	.000
Within Groups	2.36E+11	231	1021769805		
Total	3.00E+11	236			

Result: The difference between groups is significant ($F = 12.580$, $p = 0.001$, $df = 5$).

Decision: **Reject the null hypothesis.**

In further tests between the versions with comparative conditions, X1 (minimal wording and positive frame) was compared to Y1 (minimal wording and negative frame) and X2

(expanded wording and positive frame) was compared to Y2 (expanded wording and negative frame). The results of the tests are presented in Tables 7.15 to 7.17. Details of the statistical tests are shown in Tables 7.15a- 17.17a in Appendix F.

Table 7.16
ANOVA for Framing of X1 to Y1

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.23E+10	1	2.233E+10	17.847	.000
Within Groups	1.13E+11	90	1251338807		
Total	1.35E+11	91			

Result: The difference between groups is significant ($F = 17.847$, $p = 0.000$, $df = 1$).

Decision: Therefore, **reject the null hypothesis.**

Table 7.17
ANOVA for Framing of X2 to Y2

ANOVA

AMOUNT2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.86E+10	1	2.856E+10	32.717	.000
Within Groups	6.55E+10	75	872817592.6		
Total	9.40E+10	76			

Result: The difference between groups is significant ($F = 32.717$, $p = 0.000$, $df = 1$).

*Decision:*Therefore, **reject the null hypothesis.**

Table 7.18
Summary of Analysis of Variance H_{01B}

Source	*df*	*F*	*Sig.*
Combined	3	15.808	0.000
X1 vs Y1	1	17.847	0.000
X2 vs Y2	1	32.717	0.000

Hypothesis Testing of Sunk Cost

The next null hypothesis was concerned with examining the sunk cost effect. To achieve the desired comparison, six versions of the task were constructed. The details of the manipulations were outlined in Figure 7.1. Of particular interest to the testing of the

sunk cost effect were versions Z1 and Z2. Version Z1 consisted of a positive frame; version Z2 was a negative frame. The major manipulation in Z1 and Z2 was the reduction in the sunk cost amount. While the amount was the same in both Z1 and Z2, it was lower than the sunk cost amount presented in versions X1, X2, Y1 and Y2. The purpose of this manipulation was to test the impact on the sunk cost effect of the level of sunk cost.

The versions relevant to test hypothesis H_{o2B} were X2 (high sunk cost, expanded wording and positive frame) compared with Z1 (low sunk cost, expanded wording and positive frame) and Y2 (high sunk cost, expanded wording and negative frame) compared to Z2 (low sunk cost, expanded wording and negative frame). The null hypothesis is repeated below. Testing involved funding (or resource allocation from $0 to $100,000) as the dependent variable and sunk cost (dummy coded 1 or 2) as the independent variable.

H_{o2B}: The amount of funding will not be reduced by the level of past investment (sunk costs). [T1]

To test the null hypothesis, a one-way multivariate analysis of variance was performed comparing the versions in which the level of sunk cost differed, while the frame was held constant. The ANOVA was performed on X2 against Z1 and then Y2 against Z2. First, the effect of the high sunk cost against low sunk cost was tested in the positive frame versions (X2 vs Z1). Details of the statistical tests for Table 7.19 are shown in Table 7.19a in Appendix F.

Table 7.19
ANOVA for Sunk Costs of X2 to Z1

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.30E+08	1	829585554.4	1.210	.275
Within Groups	4.46E+10	65	685710164.8		
Total	4.54E+10	66			

Result:(ANOVA) X2 vs Z1 F= 1.210 (p<0.275, df = 1)

Decision: Therefore the null hypothesis cannot be rejected.

The result confirms that there was no sunk cost effect observed between versions with the same positive frame. Second, the effect of the high sunk cost against low sunk cost was tested for the negative frame (Y2 vs Z2). Details of the statistical tests for Table 7.20 are in Table 7.20a in Appendix F.

Table 7.20
ANOVA for Sunk Costs of Y2 to Z2

ANOVA

AMOUNT2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.46E+10	1	2.465E+10	23.759	.000
Within Groups	7.88E+10	76	1037331207		
Total	1.03E+11	77			

Result: (ANOVA) Y2 vs Z2 F= 23.759 ($p<0.000$, df = 1)

Decision: Therefore **the null hypothesis was rejected.**

This result shows that there was a significant sunk cost effect observed in the versions with a negative frame; however, in the positive frame the sunk cost was not a significant factor. The mean for the amount of funding was higher in version Z2 ($69,090) which had low sunk cost, than in the comparative version Y2 ($33,111). Means of all versions are presented in Table 7.21.

Table 7.21
Descriptive Details of Investment Decision Versions

Version	*N*	*Mean*	*Std. Deviation*
1 X1 +	51	65,980	34,293
2 X2 +	32	72,187	23,757
3 Y1 -	41	34,634	36,680
4 Y2 -	45	33,111	33,016
5 Z1 + #	35	65,142	28,218
6 Z2 - #	33	69,090	31,060
Total	237	55,464	35,671

+ = positive frame; - = negative frame; +# = positive frame with lower sunk cost; -# negative frame with lower sunk cost.

Hypothesis Testing of Perception of Responsibility

H_{03B}: The amount of funding will not be different between respondents due to their perceived level of responsibility for the initial decision. [T2]

A one-way analysis of variance (ANOVA) was conducted. Funding (or resource allocation from $0 to $100,000) was the dependent variable and perceived level of

responsibility (scaled from 1 to 5) was the independent variable. Perception of responsibility was tested against the decision outcome for all the versions. Details of the statistical tests for Table 7.22 are shown in Table 7.22a in Appendix F.

Table 7.22
ANOVA for Perceived Level of Responsibility/Funding

ANOVA

AMOUNT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.43E+10	5	1.285E+10	12.580	.000
Within Groups	2.36E+11	231	1021769805		
Total	3.00E+11	236			

Result: F = 12.580, (α =0.000, df = 5)

Decision: **Reject the null hypothesis.**

There were statistically significant differences between the amount of funding and the perception of responsibility. The total variance of the means is presented in Table 7.22b of Appendix F, providing multiple comparisons showing the direction of the differences between levels of perceived responsibility and funding amounts.

Second, perception of responsibility was tested against the intention to fund the request. Intention to fund (scaled from 1 to 5) was the dependent variable and perceived level of responsibility (scaled from 1 to 5) was the independent variable. Details of the tests for Table 7.23 are shown in Table 7.23a in Appendix F.

Table 7.23
ANOVA for Perceived Responsibility on Intention to Fund

ANOVA

LIKELY

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	76.838	5	15.368	6.984	.000
Within Groups	508.326	231	2.201		
Total	585.165	236			

Result: The result was F = 6.984 (α =0.000, df = 6)

Decision: **Reject the null hypothesis.**

There were statistically significant differences between the intention to fund and the perception of responsibility. The total variance of the means is presented in Table 7.23b in Appendix F, providing multiple comparisons showing the direction of the significant differences between levels of perceived responsibility and funding amounts.

Hypothesis Testing of Difference in Information Details

To test this null hypothesis, a one-way analysis of variance (ANOVA) was conducted. The information wording (explicit or minimal) of details (dummy coded as 1 or 2) was the independent variable and the amount of funding (from \$0 to \$100,000) was the dependent variable.

> H_{04B}: The amount of funding will not differ between investment versions due to the provision of explicit details. [T2]

The versions with the manipulation of terminology (wording of details) were compared. To compensate for framing effects the comparisons were made between versions that shared the same frame manipulation. X1 was compared against X2 and Y1 was compared against Y2. First, X1 was compared against X2 the dummy coding for these positive-framed versions was 1 for X1 and 2 for X2. Details of the statistical tests for Table 7.24 are shown in Table 7.24a in Appendix F.

Table 7.24
ANOVA of Manipulation of Wording X1 to X2

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.58E+08	1	757566294.6	.804	.372
Within Groups	7.63E+10	81	941948832.0		
Total	7.71E+10	82			

Result: The result was $F = 0.804$, $p = 0.372$, $df = 1$

Decision: Cannot reject the null hypothesis.

Differences in the amount of funding were not related to the differences between the information provided as explicit or minimal within the positive-framed versions. Second, Y1 was compared against Y2, the dummy coding for these negative-framed versions was 3 for Y1 and 4 for Y2. Details of the statistical tests for Table 7.25 are shown in Table 7.25a in Appendix F.

Table 7.25
ANOVA of Manipulation of Wording Y1 to Y2

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	49764291	1	49764290.67	.041	.840
Within Groups	1.02E+11	84	1211713770		
Total	1.02E+11	85			

Result: The result was $F = 0.041$, $p = 0.840$, $df = 1$

Decision: Cannot reject the null hypothesis.

Differences in the amount of funding were not related to the differences between the information provided as explicit or minimal in the negative-framed versions. There was no significant difference between the decision outcomes as a consequence of the manipulation of terminology. Therefore, this null hypothesis cannot be rejected. However, further tests were conducted to test the influence of the explicit details against the perceptions of respondents. The impact of explicit information (manipulation of wording of details) on the perceptions of the problem space was examined using the Mann Whitney U test and the Wilcoxon W test, The results are reported in Tables 7.25b 7.25c, 7.25d, and 7.25e in Appendix F.

For X1 against X2 there were no significant differences.

For Y1 against Y2 there were no significant differences.

Further testing of the comparisons within positive and negative frames using the chi-square test produced the results shown in Table 7.26.

Table 7.26
Impact of Explicit Information against Perceptions of Problem Space

Problem Space Item	***X1 vs X2 (positive)***			***Y1 vs Y2 (negative)***		
	Chi-square	*df*	α	*Chi-square*	*df*	α
Intention	4.082	6	0.666	14.784	6	0.022*
Risk	5.922	3	0.115	4.299	4	0.367
Disappointment	2.778	3	0.427	10.881	3	0.012*
Importance	3.796	2	0.150	4.239	3	0.237
Responsibility	0.423	3	0.935	6.800	4	0.147
Minimize	8.446	6	0.207	4.774	6	0.573

Sunk Cost	10.504	6	0.105	5.011	6	0.542
Control	3.312	6	0.769	1.835	6	0.934

* significant at $p < 0.05$

The results of the comparison of positive versions (X1 vs X2) were not significant; however, the negative versions (Y1 vs Y2) showed significant differences in level of intention and disappointment.

Hypothesis Testing of Problem Space

H_{05B}: The perceptions of the problem space will not differ between versions due to the framing effect. [T2]

A one-way multivariate analysis of variance was performed comparing the two sets of versions in which the framing differed. First a one-way multivariate analysis of variance (MANOVA) was performed on X1 vs Y1 followed by X2 vs Y2, Table 7.27.

Table 7.27
MANOVA Testing of Framing Effect on Problem Space

Between-Subjects Factors

		N
PAP1	1	51
	3	41

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.989	930.063[a]	8.000	83.000	.000
	Wilks' Lambda	.011	930.063[a]	8.000	83.000	.000
	Hotelling's Trace	89.645	930.063[a]	8.000	83.000	.000
	Roy's Largest Root	89.645	930.063[a]	8.000	83.000	.000
PAP1	Pillai's Trace	.175	2.204[a]	8.000	83.000	.035
	Wilks' Lambda	.825	2.204[a]	8.000	83.000	.035
	Hotelling's Trace	.212	2.204[a]	8.000	83.000	.035
	Roy's Largest Root	.212	2.204[a]	8.000	83.000	.035

a. Exact statistic

b. Design: Intercept+PAP1

Result: X1 vs Y1 MANOVA F=2.204, p<0.034

Decision: **Reject the null hypothesis.**

The result indicates that the perception of problem space differs between X1 (positive frame and minimal wording) and Y1 (negative frame and minimal wording). There is a significant difference (at $\alpha = .05$) due to framing.

Second, a one-way multivariate analysis of variance (MANOVA) was performed on X2 vs Y2, Table 7.28.

Table 7.28
MANOVA on Specific Tasks X2 to Y2

Between-Subjects Factors

		N
PAP2	2	32
	4	45

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.990	826.897[a]	8.000	68.000	.000
	Wilks' Lambda	.010	826.897[a]	8.000	68.000	.000
	Hotelling's Trace	97.282	826.897[a]	8.000	68.000	.000
	Roy's Largest Root	97.282	826.897[a]	8.000	68.000	.000
PAP2	Pillai's Trace	.480	7.839[a]	8.000	68.000	.000
	Wilks' Lambda	.520	7.839[a]	8.000	68.000	.000
	Hotelling's Trace	.922	7.839[a]	8.000	68.000	.000
	Roy's Largest Root	.922	7.839[a]	8.000	68.000	.000

a. Exact statistic

b. Design: Intercept+PAP2

Result: X2 vs Y2 MANOVA $F=7.839$, $p<0.000$

Decision: **Reject the null hypothesis.**

The perception of problem space differed between X2 (positive frame and expanded wording) and Y1 (negative frame and expanded wording). Therefore, there is a significant difference (at $\alpha = .0001$) due to framing. To further examine the effect of framing on perception of problem space, t-tests were undertaken to examine the differences between positive and negative frames. The results presented in Tables 7.27a and 7.27b in Appendix F pertain to the comparison between X1 and Y1. The results presented in Tables 7.28a and 7.28b in Appendix F pertain to the comparison between X2 and Y2.

The perception of the level of risk was significantly different between all comparative versions. However, the manipulation of positive versus negative frames was limited to the comparisons between X1 v Y1 and X2 v Y2, which also produced significant differences. This is consistent with the notion that the framing effect will exert a greater influence over the decision process when the frame is constructed to provide a contrast between positive and negative. Having established the influence of a framing effect on the perceptions of problem space the next null hypothesis was concerned with testing the relationship between the variance in funding allocation and the problem space items.

> H_{06B}: The eight problem space variables (independent) will not significantly explain the variance in funding. [T2]

A multiple regression analysis was performed, one for each framing condition, with funding as the criterion variable and all eight problem space variables simultaneously entered as predictors. By including all eight problem space measures in the multivariate model simultaneously, any shared variance among predictors would be controlled (Cohen & Cohen, 1983). The results are presented in Tables 7.29, and 7.30.

Table 7.29
Multiple Regression – Funding regressed on all Eight Problem Space Measures (Positive ~ X1+X2)

	Measure	*F*	*Dfs*	*R^2*	*Adjusted R^2*	*Standardised beta coefficients*
1	Funding	20.672 *	8, 74	.691	.657	
2	Intentions					0.579
3	Risk					-0.327
4	Disappointment					0.099
5	Importance					-0.012
6	Responsibility					-0.037
7	Minimise loss					0.075
8	Sunk costs					0.153
9	Control					0.026

* Significant at $p < 0.000$

Result: X1 vs X2 Multiple Regression F=20.672 (8,74), p<0.000

Decision: **Reject the null hypothesis.**

This means that 69.1% of the variance in funding was significantly explained by the eight independent variables in the positive-framed versions.

Table 7.30
Multiple Regression – Funding regressed on all Eight Problem Space Measures (Negative ~ Y1+Y2)

	Measure	*F*	*dfs*	*R^2*	*Adjusted R^2*	*Standardised beta coefficients*
1	Funding	53.936*	8, 77	.849	.833	
2	Intentions					0.779
3	Risk					-0.043
4	Disappointment					0.033
5	Importance					0.096
6	Responsibility					0.066
7	Minimise loss					0.103
8	Sunk costs					0.162
9	Control					-0.041

* Significant at $p < 0.000$

Result: Y1 vs Y2 Multiple Regression $F=53.936$ (8,77), $p<0.000$

Decision: **Reject the null hypothesis.**

This means that 84.9% of the variance in funding was significantly explained by the eight independent variables in the negative-framed versions. To determine whether significant differences exist between the predictive powers of the regression models, a comparison was conducted of adjusted R^2 values using Fisher's transformation for multivariate R (Hayes, 1988, 644-645). The capacity of the negative frame model was significantly greater. A total of 8 predictor variables were present in the Fisher transformation calculation.

Positive Frame = $C_R = 5.93$; critical value = 1.96, two-tailed test, significant.
Negative Frame = $C_R = 9.77$; critical value = 1.96, two-tailed test, significant.

These results support the previously reported findings, that the difference in framing of information influences characteristics of the cognitive modes exhibited by the subjects in their decision making.

Additional Tests of the Data

A factor analysis was conducted to determine the level of correlation between the problem space items. Factor analysis is used to examine whether a smaller number of common factors can account for the pattern of correlations in a larger number of variables. The eigenvalue statistic is the common measure used to determine which factors to keep (de Vaus, 1991, 261). The eigenvalue indicates the amount of variance in the pool of original variables that the factor explains. A factor rotation is used to clarify which variables belong to the new component. The analysis involved the use of the principle component extraction method and resulted in identification of four

components. Table 7.31 demonstrates that no commonalities or overlapping occurred between the factors identified by the principal component analysis.

Table 7.31
Rotated Component Matrix

	Component		
	1 ~ Sunk Cost	2 ~ Accountability	3 ~ Risk Utility
Sunk	**.916**		
Minimise	**.861**		
Intention	**.755**		
Responsibility		**.899**	
Control		**.865**	
Disappointed			**.823**
Importance			**.801**
Risk			**.419**

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalisation.
Rotation converged in 5 iterations.
Commonalities at .350

The first component consisted of sunk costs, which when combined with other items, is consistent with the results reported in Chapter 6. The descriptor "Sunk Cost" was used for this item to maintain consistency with Chapter 6. The details of the component matrix which constitutes this item are presented in Table 7.32.

Table 7.32
Component 1 ~ Sunk Cost

	+/-
Sunk Cost (too much invested to quit)	+*.916*
Minimise (wish to minimise loss)	+.861
Intention (Likely to invest)	+.755

The perception that there was too much invested to quit is a strong indicator of the sunk cost effect. The wish to minimise loss is consistent with the literature on the sunk cost effect. The intention to provide further funding is an indicator of the commitment to escalation trap associated with the sunk cost effect. This component is consistent with the proposition that non-rational behaviour is due to *"the unwillingness of individuals to let go of past costs (or wealth)"*.

Table 7.33
Component 2 ~ Accountability

	+/-
Responsibility (for initial investment)	+.899
Control (over success of project)	+.865

This component is consistent with cognitive and personality variables which suggest an accountable side to the behaviour of an individual. In the case of accountability - a central notion in management accounting (Hansen & Mowen, 2000, 517) - the person is responding to issues concerning the level of personal responsibility and their perception of the locus of control over the events (Taylor & Pincus, 2000, 359). That these two items are positively correlated is consistent with the notion that they are underlying drivers, which when combined would motivate a person to commit further funds to an investment.

Table 7.34
Component 3 ~ Risk Utility (feelings about risk)

	+/-
Disappointed (with present condition)	+.823
Importance (importance of decision)	+.801
Risk (perceived risk level)	+.419

This component is consistent with the notion of utility; the feelings of disappointment are likely to influence the perception of the importance of the decision with the compounding effect of the perception of risk. The level of importance placed upon the decision is associated with the level of disappointment regarding the poor performance of the project. The perceived level of risk further adds to the consideration of utility. The components were tested against the decision outcome using ANOVA and produced the results presented in Table 7.35. The sunk cost and accountability components were significant at the 0.000 level, however the risk utility component was not significant (0.065).

Table 7.35
Components Tested against Decision Outcome

Component	*F*	*P value*
1 ~ Sunk cost	29.684	0.000
2 ~ Accountability	4.097	0.000
3 ~ Risk Utility	1.664	0.065

Separate descriptive statistics were computed for the data in each of the different framing versions. The results are presented in Tables 7.36, 7.37, 7.38 and 7.39. A brief examination shows that five problem space items were significantly correlated with funding decisions when a positive frame was used and six items were significantly correlated when the negative frame was used. Interestingly, risk perception was significantly correlated to funding in the positive frame but not in the negative frame. The perception of responsibility and control were significantly correlated to funding in the negative frame but not in the positive.

Table 7.36
X1 & X2 Positive Frame ~ means, standard deviations and correlations (N=83)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	68.37	30.65	-								
2	Intentions	3.70	1.39	.733*	-							
3	Risk	3.51	.89	-.399*	-.112	-						
4	Disappointment	4.23	.67	.230#	.153	.069	-					
5	Importance	4.20	.64	.101	.084	.030	.403*	-				
6	Responsibility	3.75	.91	-.129	-.099	.070	-.104	.174	-			
7	Minimise loss	4.95	1.32	.378*	.296*	-.031	.357*	.300*	-.041	-		
8	Sunk costs	4.84	1.33	.531*	.500*	-.046	.301*	.139	-.063	.598*	-	
9	Control	4.53	1.46	.014	.043	-.087	-.263#	-.079	.516*	-.107	-.089	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Table 7.37
Y1 & Y2 Negative Frame ~ means, standard deviations and correlations (N=51)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	33.83	34.61	-								
2	Intentions	2.84	1.59	.893*	-							
3	Risk	3.73	1.01	.060	.046	-						
4	Disappointment	4.28	.78	-.252#	-.383*	.171	-					
5	Importance	4.22	.76	.057	-.077	.017	.554*	-				
6	Responsibility	3.71	.93	.385*	.422*	-.121	-.228#	-.041	-			
7	Minimise loss	3.52	1.47	.444*	.345*	.262#	-.181	-.021	.001	-		
8	Sunk costs	3.52	1.40	.652*	.562*	.232#	-.060	.067	.136	.619*	-	
9	Control	4.21	1.54	.428*	.447*	-.069	-.246#	.051	.592*	.231#	.362*	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Table 7.38
Z1 Positive Frame (Expanded wording/Low sunk cost) ~ means, standard deviations and correlations (N=35)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	65.14	28.21	-								
2	Intentions	4.29	1.58	.938#	-							
3	Risk	3.29	.96	-.176	-.017	-						
4	Disappointment	4.34	.64	.005	.075	.412#	-					
5	Importance	4.26	.70	.273	.277	.326	.586*	-				
6	Responsibility	3.14	.94	.480#	.444*	-.047	.063	.165	-			
7	Minimise loss	5.09	1.48	.650#	.629*	-.225	-.063	.120	.495*	-		
8	Sunk costs	5.11	1.53	.674#	.642*	-.224	.049	.246	.579*	.968*	-	
9	Control	3.49	1.44	.714#	.711*	-.146	.037	.251	.682*	.764*	.814*	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Table 7.39
Z2 Negative Frame (Expanded wording/Low sunk cost) ~ means, standard deviations and correlations (N=33)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	69.09	31.06	-								
2	Intentions	4.03	1.31	.807#	-							
3	Risk	3.18	1.01	.402#	.348#	-						
4	Disappointment	4.09	.80	-.072	-.092	-.059	-					
5	Importance	3.97	.77	.482#	.465*	.167	.206	-				
6	Responsibility	2.94	.86	.604#	.581*	.191	.008	.279	-			
7	Minimise loss	4.06	1.27	.389#	.317	.209	-.006	.448*	.316	-		
8	Sunk costs	4.09	1.21	.427#	.472*	.241	.184	.440#	.185	.707*	-	
9	Control	3.24	1.32	.690#	.716*	.455*	-.021	.375#	.669*	.566*	.533*	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Summary of Results ~ Task Two Investment Project Decision

Task Two involved a decision regarding investment in an on-going project with some chance of failure. The results indicated that framing produced significantly different choices in the amount of funding provided (null hypothesis Ho_3). However, the direction of the difference was not consistent with the expectations of prospect theory. The negative frame was expected to produce risk-seeking behaviour accompanied by escalation to commitment and a higher average amount of funding. Conversely, the positive frame was expected to produce risk-avoidance behaviour and a lower average amount of funding. This finding, while contradictory to the assumptions of prospect theory, is consistent with the findings of Bateman and Zeithaml (1989) and Duchon, Dunegan and Barton (1989). The findings, regarding the frame effect, are also consistent with the results reported in Chapter 6. An explanation for this type of behaviour was discussed in the conclusion section of Chapter 6 which drew upon the literature reviewed in Chapter 3 particularly related to the argument presented by Sitkin

and Pablo (1992). These findings suggest that incorporation of the explanations for alternative risk behaviour provides a more robust model of prospect theory.

Second, testing the sunk cost effect on decision outcome (allocation of funds) produced an unexpected result. In the positive frame, the decision outcomes from the versions with high sunk cost were not significantly different to the decision outcomes from the versions with low sunk cost. The presence of a high sunk cost and low sunk cost in the positive frame did not produce a significant difference. This could have been due to the amount of the sunk cost not being large enough to cause a difference. However, there was a significant difference found in the negative-framed versions. This may have been due to the nature of the risk behaviour, which was not consistent with the framing effect as predicted by prospect theory. These results suggest that the framing effect may act as a catalyst for different modes of cognitive processing as proposed by image theory.

Third, the perceived level of responsibility for making the initial decision was found to be a contributing factor in the decision to provide additional funds, as well as the intention to provide additional funds. This was tested through the null hypothesis Ho_5. This result is consistent with motivational theories that posit a relationship between feelings of ownership for a decision and the desire to avoid accepting that the initial decision may have been wrong (another aspect of accountability).

Fourth, funding levels were not significantly different between versions that shared the same positive or negative frame and with more specific (explicit) details. The findings suggest that additional information did not result in different decision outcomes. However, when the different versions were tested against the problem space items, some significant results appeared. These differences occurred only in the negative-framed versions and may be explained by the predicted risk propensity under prospect theory. Further examination revealed that the differences were related to the level of intention and disappointment expressed by the respondents. As a greater diversification was predicted by the theory of verbal probabilities, the findings only provided limited evidence for the existence of an influence on the cognitive reasoning of decision makers. The cognitive reasoning was represented by the respondents' perceptions of the problem space.

Fifth, testing of the problem space produced significant results in both positive and negative frames, although the negative frame was stronger. Further analysis of the predictive power provided evidence that the negative frame outcomes were significantly greater than in the positive frame. The evidence was not as clear cut as Dunegan's (1993) findings. However, the framing effect did have an impact on problem space items. The items affected in both the explicitly and minimally worded versions were the desire to minimize loss, perception of sunk cost and intention to provide funding. In addition, the perception of risk was also affected in the explicitly worded version. These findings provide evidence that the framing influenced the perception of problem space. Principle component analysis produced three distinct factors from the problem space items. These factors closely approximate the factors produced in Chapter 6 and were therefore, categorised using the same descriptors – that is *sunk cost*, *accountability* and *risk*.

Conclusions

The sunk cost effect was found to be significant in both the outsourcing decision task and in the negative frame of the investment decision task but not in the positive frame of the investment decision task. One possible explanation for this anomaly — that the difference between the amount of sunk cost was not large enough — was discounted since the differences in sunk cost were the same in the negative-frame versions. The only difference was the framing, suggesting that the framing effect may be responsible for this anomaly.

Although framing was found to be significant, the direction of the results was not consistent with prospect theory. The outcomes of tests of the framing effect in the outsourcing task were contradictory to the direction of risk behaviour predicted by prospect theory. The results of the investment task also produced contradictory findings. Negative framing, which should have produced risk-taking behaviour resulted in risk-avoidance behaviour. Positive framing, which should have elicited risk-avoidance behaviour resulted in risk-taking behaviour. A higher percentage of respondents should have chosen the outsourcing option in the negative frame than in the positive frame under prospect theory. Risk-avoidance was interpreted to mean that respondents would be less likely to risk changing from the existing situation. The anomaly found in the

investment task, reported in Chapter 6 was therefore not limited to one professional group, but extended in survey 3 to the accountants.

CHAPTER 8
Conclusions and Implications of the Research

Chapter Introduction

In this chapter, conclusions and contributions are drawn from the empirical analysis of the central research question of this thesis:

> *Are trained professionals adversely influenced by sunk cost when making financial decisions?*

The chapter commences with a synthesis of the normative treatment of sunk cost. This is followed by a discussion of the observed violations to expected utility theory. The rational decision model inherent in traditional management accounting and the concept of relevant costs are re-considered in view of the findings. The results are then analysed for indications of support for the behavioural predictions of image theory and prospect theory. The findings relating to decision behaviour and human judgement are also discussed.

The contribution of the theoretical research design is reflected upon and discussed. In addition, the answers to the research issues, which were used to guide the study, are compared with regard to the major findings. This is followed by a discussion of the limitations of the scope of the research, suggestions for future research and implications for society.

Normative Theories

The normative treatment of sunk cost, as discussed in Chapter 2, is based on the premise that past costs are irrelevant to decision making. Whether this premise is explicitly stated, as found in the economic and management accounting literature, or implicit, as identified in finance models – sunk costs are consistently deemed irrelevant to financial decision making. As well, the form a sunk cost takes is not restricted to an asset with a financial value. The literature extends the concept of what is meant by *past costs* to encompass the everyday activities, for example time spent waiting in a shopping queue Normative theory assumes that the actions of individuals should fit the predictions of

expected utility theory, which consists of a set of axioms devised by Von Neumann and Morgenstern (1947), Savage (1954) and others, that postulate the criteria for rational decision making behaviour. Individuals are thus hypothesised to be self-maximizers whose ultimate goal is to maximize expected utility (Robson, 2001). Within this framework the only consideration is to identify which alternative course of action will maximize utility in the future, given the present as a point of reference while the past is irrelevant. The past (a sunk cost) is irrelevant because it cannot be changed, and the present (market value) serves to identify opportunities.

The normative approach to the treatment of sunk cost provides an important insight into rational decision models of economics, finance and management accounting. A *contribution of this thesis* is the documentation of the normative origin for the treatment of sunk cost by these three disciplines. Rational decision making is based on choosing the prospect that offers the highest expected utility, which is considered the optimal payoff. In the rational choice model, instinct, experience and emotions are excluded from the process since the basis for making the *rational choice* is predetermined and predicated upon a logically structured and deductive process.

Rational Decision Models

Normative models provide people with a formula for rational decision behaviour, however, normative models cannot compensate for human nature. The findings indicated that the process of rational decision making was not always followed in practice when sunk cost information was included in the decision process. The issues raised by the research suggest that decision makers *are* most certainly influenced by information other than relevant costs.

The results of the three surveys confirmed that a majority of decision makers did not adhere to the rational decision model. Since rational choice is devoted to utility maximisation and therefore the maximisation of *payoffs,* the individual decision maker should not be influenced by extraneous variables such as past experience. However, the behaviour of individuals observed in this research and in prior research suggests that past experience does influence decision making. The optimal choice was not selected by all the respondents— contrary to the assumptions of the rational choice model.

According to the invariance axiom, rational decisions should lead to the same optimal choice. If all the respondents made the optimal choice, then the normative predictions of rational choice would be upheld. However, as prior research reported, not all individuals follow the rational model. The findings of this thesis add to the growing amount of evidence that attests to the continued violation of rational choice models.

Expected Utility Theory

As predicted by prior research, violations of expected utility theory were observed in the results of the surveys. These findings were reported in detail in Chapters 5, 6 and 7. In particular the axioms of dominance and invariance were violated. Contrary to the dominance axiom, the dominant option in the outsourcing task was not chosen by all respondents, while in the investment task the majority of respondents escalated commitment. The dominant option in the outsourcing task was to select the outsourcing option. Based on the financial information outsourcing maximized profit (that is, minimized cost). Contrary to the invariance axiom, different representations of the same choice (created by framing), in both the outsourcing task and investment task, yielded different preferences.

Influence of Sunk Cost Information

Sunk cost was found to influence decision making in both outsourcing and investment tasks. The decisions of the respondents were found to be more aligned to the propositions of behavioural theories than normative models of rational behaviour. This thesis builds upon the research of Dunegan (1993) and Dunegan, Duchon and Amos (1995), although the findings were not entirely consistent with these previous American studies. The surveys in this thesis represent the first time these propositions have been tested in the Australian environment. An important difference between the studies lies in the conclusions regarding the role of sunk cost information and the additional test by manipulating the level of sunk cost.

The findings of the research showed that there was a demonstrable sunk cost effect measured in the data from the surveys. Where sunk cost information was present, the decision outcomes were shown to be sub-optimal. The research demonstrated that the decision makers were adversely influenced by the presence of sunk cost information and did not make decisions that maximized utility (that is, maximize profit or minimize

cost). These findings violate the normative propositions of traditional management accounting that only relevant costs should influence decisions. Any other model leads to sub-optimal outcomes. Evidence of the existence of the sunken cost effect was found across all three professional groups studied.

Behavioural Theories and Experimental Evidence

Previous experimental research demonstrated that individuals, when making decisions, do not always follow the normative prescription to ignore sunk cost. The extant literature highlights the differences between actual behaviour and normative rational decision models. Factors such as emotions, past experience and other intervening influences were found to affect the decision behaviour of individuals.

Various behavioural theories emerged to explain the observed behaviour. The main *contribution of this thesis* was to test the sunk cost effect through a series of surveys. The analysis of the results provides evidence that trained professionals were influenced by sunk cost when making financial decisions. The discussion of the findings is directed at examining the implications of the observed behaviour within the context of normative and behavioural theories.

Image Theory

Image theory (Beach, 1990) posits that the perception of the problem space and the image compatibility that decision makers cognitively develop should be consistent with the level of responsibility that they feel toward the original decision.

Problem Space

Perceptions emerging from the process of information assimilation and evaluation are collectively referred to as the problem space (Payne, 1980). One problem space item, the perception of responsibility for the initial decision, was found to exert an influence over the amount of funding provided in the reinvestment decision. Staw and Ross (1978) predicted that responsibility for the initial decision would cause subjects to escalate their commitment as a form of justification that the initial decision was correct.

The results are consistent with image theory, with the level of responsibility found to be positively correlated with a higher level of funding provided.

The perceived level of responsibility for making the initial decision was found to be a contributing factor in the decision to provide additional funds, as well as the intention to provide additional funds. This was consistent with motivational theories that posit a relationship between feelings of ownership for a decision and the desire to avoid accepting that the initial decision may have been wrong— leading to an escalation of commitment to the original decision.

Image Compatibility

Image compatibility refers to a person's subjective assessment of the progress of a project relative to current performance and future goals (Dunegan, 1993, 1995). Testing of image compatibility produced mixed results. Consistent with the findings of Dunegan, Duchon and Ashmos (1995), low image compatibility was a significant predictor of the level of funding. The unexpected finding was that high image compatibility was *also* a significant predictor of the level of funding. However, the statistical significance was smaller compared to that of low image compatibility and the percentage increase in the R^2 was also smaller by comparison. Image theory posits that information use can be inferred by a significant relationship between information and decision outcomes. These results confirm that the reduction in information use was more significant as image compatibility increases.

Prospect Theory

Prospect theory posits that there are two phases (editing and evaluation) in the decision making process (Kahneman & Tversky, 1979). In the evaluation phase the value function is determined relative to deviations from the reference point (the status quo or current asset level) (Kahneman & Tversky, 1979, 286). The reference point is acknowledged as being susceptible to a phenomenon known as framing (Tversky & Kahneman, 1981, 453).

Reference Points and Sunk Cost

The manipulation of the level of sunk cost was expected to affect the reference point. Testing the sunk cost effect on decision outcome (allocation of funds) produced an

unexpected result. In the positive frame, the decision outcome from the versions with high sunk cost was not significantly different to the decision outcome from the versions with low sunk cost. Succinctly, the comparison between high sunk cost and low sunk cost in the positive frame did not produce a significant difference. As the reference point was considered to be representative of the status quo (Kahneman & Tversky, 1979), manipulation of the amount of sunk cost was expected to produce a significant difference.

An argument worth considering is that the amount of sunk cost was not great enough to cause a difference. However, as there was a significant difference found between the negative-framed versions in which the amount of sunk cost was reduced this argument does not appear to be valid. Another explanation may lie with the specific positive frame effect observed in this research the nature of this effect is discussed in the next section.

Framing Effect

The testing of the framing effect also produced unexpected results. Low-risk behaviour was found to occur in the negative-framed versions of the surveys, while high-risk behaviour was found to have occurred in the positive-framed versions. The results indicate that framing produced significantly different choices in the amount of funding provided. However, the direction of the difference was not consistent with the expectations of prospect theory. That is, the negative frame was expected to produce risk-seeking behaviour accompanied by escalation to commitment and subsequently a higher average amount of funding. Conversely, the positive frame was expected to produce risk-avoidance behaviour and a lower average amount of funding. This finding, while contradictory to the assumptions of prospect theory, was consistent with the findings of Bateman and Zeithaml (1989) and Duchon, Dunegan and Barton (1989).

When the sunk cost effect in the investment task was tested for significance between framing conditions, there were further unexpected results. The framing phenomenon observed in this research is depicted in Figure 8.1 (based on Sitkin & Pablo, 1992), showing the relevant findings from the two surveys of the investment task (reported in Chapters 6 and 7). Figure 8.1 shows that most of the results produced findings that were contradictory to the direction of risk behaviour predicted by prospect theory. The

negative-framed tasks of Survey 2 and 3 produced risk-averse behaviour rather than risk-seeking behaviour. The positive-framed tasks of Survey 2 and 3 produced risk-seeking behaviour rather than risk-averse behaviour. The only findings that were consistent with prospect theory were derived from negative-framed tasks with low sunk costs in both Surveys 2 and 3, depicted in quadrant 4 of Figure 8.1.

Figure 8.1
Results of Framing Effects Juxtaposed against Predicted Risk Behaviour

		Task Frame Characteristics	
		Positive	Negative
Risk Propensity	Risk Averse	Prospect Theory [Quadrant 1] *Prediction:* **Low Risk Behaviour**	Threat-rigidity/Hypervigilance [Quadrant 2] *Prediction:* **Low Risk Behaviour** Findings: Survey 2 $39,354 –F; H S/C Survey 3 $34,634 –F; H S/C $33,111 –F; H S/C
	Risk Seeking	Attention to Opportunities [Quadrant 3] *Prediction:* **High Risk Behaviour** Findings: Survey 2 $53,484 +F; H S/C Survey 3 $65,980 +F; H S/C $72,187 +F; H S/C $65,142 +F; L S/C	Prospect Theory [Quadrant 4] *Prediction:* **High Risk Behaviour** Survey 2 $60,227 –F; L S/C Survey 3 $69,090 –F; L S/C

H S/C = High sunk cost; L S/C = Low sunk cost; -F = negative frame; +F = positive frame

An explanation for this type of observed behaviour, as suggested by Sitkin and Pablo (1992), is that the framing effect may be a catalyst for different modes of cognitive processing. This appears to be consistent with the predictions of image theory that when controlled modes of cognitive processing are used, information is subjected to a more comprehensive, deliberate and thorough analysis. Alternatively, when automatic modes are used, processing of information is limited, there is a reduced attention to detail, and fewer incoming cues contribute to creating a cognitive representation of the task. The automatic mode appears to offer a plausible explanation for the observed results. Importantly, these results suggest that risk propensity was moderated by risk perception and this is consistent with the theoretical model, depicted in Figure 8.2, developed in this thesis.

Other Behavioural Issues

Rational vs Intuitive Decision Making

The results suggest that the decisions of the self-assessed "rational" decision makers were more closely associated with those of the self-assessed "intuitive" decision makers under the positive frame, than under the negative frame. The results also showed that the decision to outsource was significantly different between positive- framed and negative-framed versions of the task.

Asset Specificity

According to the theory of transaction cost economics (Williamson, 1979), the degree of asset specificity will be an important consideration in an outsourcing decision. In testing transaction cost theory, the presence of an asset-specific investment was found to influence the decision to outsource. In Survey 1 (Hospitals ~ Outsourcing Task), the effect was found to be systematically different between the responses of versions with and without asset specificity. The findings are consistent with transaction cost theory which posits that decision makers are influenced by any additional cost of doing business with an external supplier. The same influence was found to exist in Survey 3 (Accountants ~ Outsourcing Task). The results suggest that an outsourcing decision made by hospital managers and accounting professionals can be influenced by asset specificity.

Mental Accounting

The findings suggest that people have different approaches to constructing mental accounts when considering alternative courses of action. In particular there appears to be difficulty in distinguishing between relevant and irrelevant information. This inability to process information may be responsible for people adopting mental strategies that simplify the procedure and sometimes this could lead to biases in judgement.

Triangulation of Survey Results

For the purpose of this research, triangulation involved the comparison of the findings from the three different surveys. Table 8.1 identifies the issues and the findings from the three surveys.

Table 8.1
Comparison of the Results of the Hypothesis Testing

	Sunk Cost	*Asset Specificity*	*Framing Effect*	*Problem Space*	*Image Compatibility*
Survey 1	Significant	Significant	Not applicable	Not applicable	Not applicable
Survey 2	Significant	Not applicable	Significant*	Significant	Significant
Survey 3	Significant	Significant	Significant*	Significant	Not applicable

* Although significant some aspects of these results were not consistent with the prediction of prospect theory.

These findings provide confirmation of the existence of the sunk cost effect in the three professional groups surveyed.

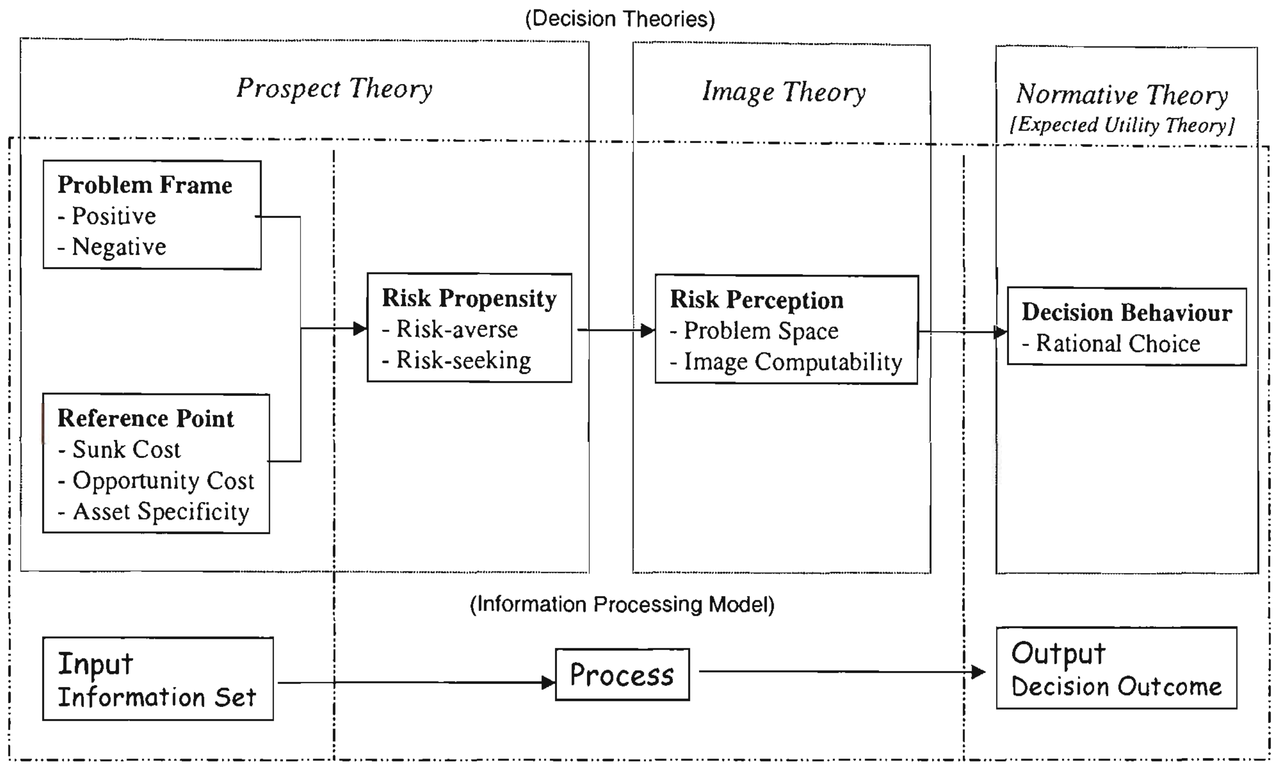
Conclusions Regarding Research Design

The use of multiple surveys to test various aspects of the sunk cost phenomenon proved to be a major project requiring a great deal of monitoring and planning. The compilation, processing and analysis of such a diverse set of data was also time consuming and cumbersome. However, the wealth of information provided a rich and diverse source for investigation and the results produced some unexpected findings. The simple information processing model provided a useful reference point from which to develop the research and to determine the role of the various variables identified in the surveys.

Critique of the Theoretical Model Variables

The theoretical model proposed in Chapter 4 proved to be useful in examining the sunk cost effect and the relationship of the variables. This model *contributes to* the development of a conceptual framework for empirically testing the sunk cost effect and to an understanding of the conceptual links between prospect theory and image theory.

Figure 8.2
Theoretical Research Model



The model successfully allowed the combination of prospect theory, image theory and expected utility theory for the purpose of the survey research. Risk propensity – predicted by prospect theory to be influenced by the problem frame and reference point – was shown to be moderated by the cognitive perception of risk. The results indicate that the model is capable of accommodating the effects of framing, sunk cost, problem space and image compatibility as well as other variables, such as asset specificity and opportunity costs. The model provides a framework for testing the predicted outcomes of expected utility theory – that is the optimal or rational choice – that can be adapted to allow for further manipulation of variables.

Limitations of the Research

Issues Regarding Operationalisation of Constructs

Because the studies were cross-sectional, cause and effect relationships can be difficult to establish (Robson, 2000). Although the items chosen to represent the problem space and image compatibility were justified on the basis of prior research, there remains the possibility that other, more salient items, were not considered or included. The

magnitude of the dollar amounts used in the studies might not have been significant to all respondents.

Issues Regarding Decision Tasks

The less information provided, the more likely decision makers are to exhibit *desirability bias* or *wishful* thinking (Dunegan, 1993). This implies that when there are too few cues or if the cues are too vague to rely upon, decision makers are more likely to interpret the data according to their own reference point— thereby confounding the manipulation of the reference point. A high level of ambiguity can also be responsible for stronger than expected framing effects (Frisch, 1993).

In attempting to create tasks that were consistent with situations likely to occur in context of the industry, certain difficulties arise. Context cues not directly related to the decision task may influence decision maker's perceptions about the nature of the task. Information communicated with the task often comes with a presumed guarantee of relevance (Sperber & Wilson, 1986). As a consequence, a seemingly unrelated cue may influence decision makers to place greater significance on that single cue. Mandel (2001) argued that where there were two types of context cues used in an investment task a reflection effect could occur. For example, if a decision maker's attention is focused on the probabilities, they could perceive the task as a statistical problem however, should their focus be on the gains or losses they could perceive the task as a financial problem (Mandel, 2001). The possibility of this reflection effect was not tested in this research.

Future Research

Further research related to this thesis could involve expanding the study to a wider variety of professional groups— or even non-professional groups— that possess varying degrees of training or experience in accounting thereby investigating the sunk cost effect in context of the influencing variables. Research could employ multiple reference points or more complex framing of the task. Individuals could also be required to repeat the task, with a control group repeating the same task and other groups having different manipulations. These alternatives would provide wider generalisability through comparison with the findings of this study.

The level of sunk cost in this research clearly resulted in different decision outcomes. Whether these findings can be translated to situations in which the sunk cost is not measured in terms of dollar amounts would provide valuable insight into the sunk cost effect. Future research could incorporate and manipulate different types of sunk cost – such as time – where the influence of time could be varied and tested.

Finally, in terms of the influence of sunk cost on the cognitive process, wider emphasis could be given to the perception of risk. This could be achieved by further development of instruments to better measure problem space and image compatibility with items that are more directly related to sunk cost or aspects of the tasks concerning sunk cost information.

Implications for Society

Decision making in the context of this thesis was concerned with outcomes regarding the allocation of scarce resources. The efficient allocation of resources has long-term effects on society (Brealey & Myers, 1996; Horngren & Foster, 1991). Improved understanding of the behavioural aspects of decision making by various sections of the business community provide opportunities for reflection and change in the training of decision-making professionals. Both the public sector and private sector need to improve decision making under sunk cost because of the potential for enormous costs to society that can arise from erroneous decisions. For this reason the sunk cost effect is extremely important and needs to be better understood.

There are examples where social costs were incurred because the sunk cost effect led to wrong decisions being made. For example, the escalation of commitment in the case of the mismanagement of the administration of Eastern Airlines by the US Bankruptcy Court which cost the taxpayers an additional two billion dollars (US) because of the inability of the court to ignore sunk costs (Weiss & Wruck, 1998, 64). A further example is the Taurus information technology project commissioned by the London Stock Exchange at an initial cost of £50 million and after the costs had blown out to £80 million was abruptly cancelled exacerbating the waste (Drummond, 1998). The impact on society was far greater as the City of London incurred an estimated £400 million loss through preparing for the implementation of Taurus (Drummond, 1998, 913).

Implications for the Accounting Education

There are several possible implications for Management Accounting education arising from this dissertation. The results of this research may be discouraging to accounting educators because rational decision models have been found to be disregarded— not just by hospital managers and financial planners— but by a majority of accountants.

Management accounting courses traditionally include the topic of relevant costing, which emphasises the importance of incremental and opportunity costs and discuss the irrelevance of sunk costs. However, the results indicated that there is a high proportion of accountants who do not adhere to the normative prescriptions to use only relevant costs during the process of rational decision making. This suggests that there is a need for a different approach to education and training. Educators may have to rethink their explanations of decision making in the context of relevant costing and make a more convincing case for the irrelevance of past costs.

Implications for Business and Management

For the past twenty years textbooks in economics, finance and management accounting have defined sunk costs as irrelevant to decision making. Yet people have generally or at least frequently failed to apply the rational decision model when confronted with a sunk cost. While managers have become more conversant with financial mathematics, such as net present value calculations, the more fundamental treatment of sunk cost has remained particularly problematic in outsourcing or investment decisions. Even finance professionals can be wrong about the relevance of a sunk cost. For example, the Western Australian Treasury recently produced a guide for public sector managers on evaluating outsourcing decisions that included an error of the basic principle in the treatment of a sunk cost (Johnstone, 1999, 38). This guide had the potential to direct public sector managers to make erroneous outsourcing decisions.

The research presented in this dissertation highlights the potential for managers, financial planners and accountants to make sub-optimal decisions because of a sunk cost. Decisions that result from such biases can have adverse consequences for corporations and their stakeholders (Ashton & Ashton, 1995). Education is required to raise greater awareness in managers of the significant implications of the sunk cost effect on business decisions. Managers in both the private and public sector need to

better understand the issue that a sunk cost is irrelevant in order to avoid wasting valuable resources and failing to arrive at the optimal financial decision.

DECISION MAKING UNDER SUNK COST

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BBus(Acc), MCom(Hons), Grad Cert Ed(Higher Ed)

VOLUME 2 OF 2

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2002

BRIEF TABLE OF CONTENTS

VOLUME 1

VOLUME 2

TABLE OF CONTENTS

VOLUME 1

VOLUME 2

BIBLIOGRAPHY

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Appendix A

Hospitals

Letter of Remittal

2 February 2000

The Chief Executive Officer
"Hospital"
"Address"
"City" "State" "Postcode"

Dear Sir/Madam,

This letter is to invite your co-operation in a research study concerning outsourcing decisions. Almost all private and public sector entities now outsource part of their operations. The potential financial and other consequences, both positive and negative, of a decision to outsource are often very large. The purpose of this study is to examine the general attitudes (possibly biases) and financial thinking of people involved in making outsourcing decisions. This will assist in our understanding of what motivates outsourcing and how people can be better equipped to make well considered choices between in-house and external providers.

I request that you, or an appropriate officer, complete the attached questionnaire and return it to me at your earliest convenience. It would be appreciated by 2nd March. The questionnaire should take less than ten minutes to complete. This survey is part of a controlled experiment. Please consider only the circumstances described, even if they appear simplistic. You are not required to disclose any information of a confidential nature and your response will be kept completely confidential. Only grouped data will be used in the analysis process.

While your response is confidential, the questionnaire has been numbered for administrative purposes only, to facilitate follow-up procedures that prevent bothersome unnecessary reminders.

The authors of this study will provide a description and interpretation of overall results to all survey respondents. It is expected that this information will be ready for distribution in 3-4 months.

You can send your reply through any of the following media:

- Fax to Attention: Greg Laing on (07) 5430-1210
- Fax to special E-fax number 00 111 240 414 7443, which will cost no more than normal mail or fax.
- Return mail to Greg Laing
  Reply Paid No.95
  Faculty of Business
  University of the Sunshine Coast
  Maroochydore DC QLD 4558

Thank you for your co-operation in this research study.

Yours sincerely,

Greg Laing

Reminder Card

The Chief Executive Officer,

Just a short note to remind you that the questionnaire I sent to you on the 2nd February is important.

Please excuse this reminder if you have already returned your questionnaire.

Thank you
Greg Laing

Follow-up Letter

20 March, 2000

The Chief Executive Officer
"Hospital"
"Street"
"City' "State""Postcode"

Dear Sir/Madam,

I am concluding the data collection phase of the research study concerning outsourcing decisions and have not yet received your reply. Perhaps you are not the person to whom the survey should have been addressed; if so, will you please hand the survey to the appropriate member of your staff. Perhaps the original survey has gone astray. To avoid delay enclosed is another for your convenience. Please return the survey by the 30th March.

This research has highlighted a number of interesting issues from the responses that have so far been received. However, to gain more meaningful data on what motivates decisions regarding outsourcing a wider cross section of responses is necessary. Please help as I believe this extremely valuable study should yield useful and insightful information for all segments of hospital administration.

To minimise your valuable time, this one page survey, can be faxed directly to (07) 5430-1210, without the need for any cover sheet.

Yours sincerely,

Greg Laing

Version 1

Please provide your response to the following questions.

Your position is best described as: Chief Executive Officer / General Manager / Financial Controller / Accountant / Operations Manager / Other please specify: ....

How many years experience do you have in management within the hospital sector? ....

Please give the last two digits of the year in which you were born? ....

Please specify your gender. Female ☐ Male ☐

Approximately how many beds does your hospital/organisation have? ....

Have you previously examined the possibility of outsourcing any part of the operations of this or any other hospital? YES ☐ NO ☐

If your answer was "yes" did you decide to outsource? YES ☐ NO ☐

Scenario Details:
You are the manager of a hospital/resthome/nursinghome and have to make a decision regarding the outsourcing of patient meals. The choice is between internal production and outsourcing. Your decision is to be made primarily upon financial grounds.

This decision relates to the next five (5) years, which is the expected remaining life of the existing kitchen equipment and also the contract period for outsourcing.

The present value of costs of future internal preparation is $3,000,000.

An external company will prepare and sell the meals at a cost of $2,600,000 (measured as a present value) and would employ the current kitchen personnel of the hospital. The quality of meals would remain the same. Warming up the externally produced meals on site would require the purchase of a warming oven for $300,000. This equipment could be used for warming up internally prepared meals or meals of other external catering companies.

Please place a tick to indicate your selection:

☐ Internal production of patient meals.

☐ Outsource production of patient meals.

Please briefly explain your reasoning for this decision:

Version 2

Please provide your response to the following questions.

Your position is best described as: Chief Executive Officer / General Manager / Financial Controller / Accountant / Operations Manager / Other please specify: ....

How many years experience do you have in management within the hospital sector? ....

Please give the last two digits of the year in which you were born? ....

Please specify your gender. Female ☐ Male ☐

Approximately how many beds does your hospital/organisation have? ....

Have you previously examined the possibility of outsourcing any part of the operations of this or any other hospital? YES ☐ NO ☐

If your answer was "yes" did you decide to outsource? YES ☐ NO ☐

Scenario Details:
You are the manager of a hospital/resthome/nursinghome and have to make a decision regarding the outsourcing of patient meals. The choice is between internal production and outsourcing. Your decision is to be made primarily upon financial grounds.

This decision relates to the next five (5) years, which is the expected remaining life of the existing kitchen equipment and also the contract period for outsourcing.

The present value of costs of future internal preparation is $3,000,000.

An external company will prepare and sell the meals at a cost of $2,600,000 (measured as a present value) and would employ the current kitchen personnel of the hospital. The quality of meals would remain the same. Warming up the externally produced meals on site would require the purchase of a warming oven for $300,000. However, this equipment could not be used if the hospital changes to another external catering company.

Please place a tick to indicate your selection:

☐ Internal production of patient meals.

☐ Outsource production of patient meals.

Please briefly explain your reasoning for this decision:

Version 3

Please provide your response to the following questions.

Your position is best described as: Chief Executive Officer / General Manager / Financial Controller / Accountant / Operations Manager / Other please specify: ....

How many years experience do you have in management within the hospital sector? ....

Please give the last two digits of the year in which you were born? ....

Please specify your gender. Female ☐ Male ☐

Approximately how many beds does your hospital/organisation have? ....

Have you previously examined the possibility of outsourcing any part of the operations of this or any other hospital? YES ☐ NO ☐

If your answer was "yes" did you decide to outsource? YES ☐ NO ☐

Scenario Details:
You are the manager of a hospital/resthome/nursinghome and have to make a decision regarding the outsourcing of patient meals. The choice is between internal production and outsourcing. Your decision is to be made primarily upon financial grounds.

This decision relates to the next five (5) years, which is the expected remaining life of the existing kitchen equipment and also the contract period for outsourcing.

The present value of costs of future internal preparation is $3,000,000. The hospital purchased new cooking equipment 2 years prior to this decision, at a total cost of $1,400,000. This equipment would have no other use and can only be sold for scrap value which is a negligible amount.

An external company will prepare and sell the meals at a cost of $2,600,000 (measured as a present value) and would employ the current kitchen personnel of the hospital. The quality of meals would remain the same. Warming up the externally produced meals on site would require the purchase of a warming oven for $300,000. This equipment could be used for warming up internally prepared meals or meals of other external catering companies.

Please place a tick to indicate your selection:

☐ Internal production of patient meals.

☐ Outsource production of patient meals.

Please briefly explain your reasoning for this decision:

Version 4

Please provide your response to the following questions.

Your position is best described as: Chief Executive Officer / General Manager / Financial Controller / Accountant / Operations Manager / Other please specify: ....

How many years experience do you have in management within the hospital sector? ....

Please give the last two digits of the year in which you were born? ....

Please specify your gender. Female ☐ Male ☐

Approximately how many beds does your hospital/organisation have? ....

Have you previously examined the possibility of outsourcing any part of the operations of this or any other hospital? YES ☐ NO ☐

If your answer was "yes" did you decide to outsource? YES ☐ NO ☐

Scenario Details:
You are the manager of a hospital/resthome/nursinghome and have to make a decision regarding the outsourcing of patient meals. The choice is between internal production and outsourcing. Your decision is to be made primarily upon financial grounds.

This decision relates to the next five (5) years, which is the expected remaining life of the existing kitchen equipment and also the contract period for outsourcing.

The present value of costs of future internal preparation is $3,000,000. The hospital purchased new cooking equipment 2 years prior to this decision, at a total cost of $1,400,000. This equipment would have no other use and can only be sold for scrap value which is a negligible amount.

An external company will prepare and sell the meals for $2,600,000 (measured as a present value) and would employ the current kitchen personnel of the hospital. The quality of meals would remain the same. Warming up the externally produced meals on site would require the purchase of a warming oven for $300,000. However, this equipment could not be used if the hospital changes to another external catering company.

Please place a tick to indicate your selection:

☐ Internal production of patient meals.

☐ Outsource production of patient meals.

Please briefly explain your reasoning for this decision:

Version 5

Please provide your response to the following questions.

Your position is best described as: Chief Executive Officer / General Manager / Financial Controller / Accountant / Operations Manager / Other please specify: ....

How many years experience do you have in management within the hospital sector? ....

Please give the last two digits of the year in which you were born? ....

Please specify your gender. Female ☐ Male ☐

Approximately how many beds does your hospital/organisation have? ....

Have you previously examined the possibility of outsourcing any part of the operations of this or any other hospital? YES ☐ NO ☐

If your answer was "yes" did you decide to outsource? YES ☐ NO ☐

Scenario Details:
You are the manager of a hospital/resthome/nursinghome and have to make a decision regarding the outsourcing of patient meals. The choice is between internal production and outsourcing. Your decision is to be made primarily upon financial grounds.

This decision relates to the next five (5) years, which is the expected remaining life of the existing kitchen equipment and also the contract period for outsourcing.

The present value of costs of future internal preparation is $3,000,000. The hospital purchased in new cooking equipment 2 years prior to this decision, at a total cost of $500,000. This equipment would have no other use and can only be sold for scrap value which is a negligible amount.

An external company will prepare and sell the meals for $2,000,000 (measured as a present value) and would employ the current kitchen personnel of the hospital. The quality of meals would remain the same. Warming up the externally produced meals on site would require the purchase of a warming oven for $300,000. This equipment could be used for warming up internally prepared meals or meals of other external catering companies.

Please place a tick to indicate your selection:

☐ Internal production of patient meals.

☐ Outsource production of patient meals.

Please briefly explain your reasoning for this decision:

Version 6

Please provide your response to the following questions.

Your position is best described as: Chief Executive Officer / General Manager / Financial Controller / Accountant / Operations Manager / Other please specify: ....

How many years experience do you have in management within the hospital sector? ....

Please give the last two digits of the year in which you were born? ....

Please specify your gender. Female □ Male □

Approximately how many beds does your hospital/organisation have? ....

Have you previously examined the possibility of outsourcing any part of the operations of this or any other hospital? YES □ NO □

If your answer was "yes" did you decide to outsource? YES □ NO □

Scenario Details:
You are the manager of a hospital/resthome/nursinghome and have to make a decision regarding the outsourcing of patient meals. The choice is between internal production and outsourcing. Your decision is to be made primarily upon financial grounds.

This decision relates to the next five (5) years, which is the expected remaining life of the existing kitchen equipment and also the contract period for outsourcing.

The present value of costs of future internal preparation is $3,000,000. The hospital purchased new cooking equipment 2 years prior to this decision, at a total cost of $500,000. This equipment would have no other use and can only be sold for scrap value which is a negligible amount.

An external company will prepare and sell the meals for $2,000,000 (measured as a present value) and would employ the current kitchen personnel of the hospital. The quality of meals would remain the same. Warming up the externally produced meals on site would require the purchase of a warming oven for $300,000. However, this equipment could not be used if the hospital changes to another external catering company.

Please place a tick to indicate your selection:

□ Internal production of patient meals.

□ Outsource production of patient meals.

Please briefly explain your reasoning for this decision:

Appendix B

Financial Planners

Letter of Remittal

25 May 2000

"Manager"
"Company"
"Street"
"City' "State""Postcode"

Dear Sir/ Madam,

This letter is to invite your co-operation in a research study concerning financial decision making. I am undertaking this study for completion of a PhD, through the University of Wollongong. The providing of financial advice and investment appraisal is an area of growing concern and little research has focused on the specialist area of financial planning. The potential consequences, both positive and negative, of a decision based on financial information are often very large. The purpose of this study is to examine the general attitudes in financial decision-making.

I request that you, or an appropriate officer, complete the attached questionnaire and return it to me at your earliest convenience. I realise that you have many demands on your time, and this should take less than ten minutes to complete. Please consider only the circumstances described, even if they appear simplistic. You are not required to disclose any information of a confidential nature and only grouped data will be used in the analysis process.

This survey is part of a controlled experiment. All responses to the questionnaire will be kept strictly confidential. If you have any questions, please feel free to phone me on (07) 5430-1263.

It would be appreciated if you can complete and return the questionnaire by the 22 June. A pre-paid self-addressed envelope is enclosed for your convenience.

Thank you for your time and co-operation in this research study.

Yours sincerely,

Greg Laing

Reminder Card

"Manager"
"Company"

Just a short note to remind you that the questionnaire I sent to you on the 25th May is important.

Please excuse this reminder if you have already returned your questionnaire.

Thank you
Greg Laing

Follow-up Letter

10 July 2000

"Manager"
"Company"
"Street"
"City' "State" "Postcode"

Dear Sir/ Madam,

Further to my letter, of the 25th May, regarding a survey of decision making. Perhaps you were not the person to whom the questionnaire should have been addressed, and you may have delegated the matter or perhaps the questionnaire has been misplaced or lost in the mail. At any rate, I am enclosing another questionnaire and reply paid envelope for your convenience. Would you please complete the survey and return it in the envelope provided, by the 20th July.

Thank you for your time and co-operation and should you have any questions please contact me by phone on (07) 5430-1263, fax (07) 5430-1212 or email glaing@usc.edu.au.

Yours faithfully,

Gregory K. Laing

Version 1

As a fund manager, one of your project teams has come to you requesting an additional $100,000 in funds for an investment project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team remains confident it will be a success and well worth the investment.

You currently have $500,000 remaining in your budget that is unallocated. These funds must carry you for the rest of the financial year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities. Evaluating the situation, you believe there is a fair chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the investment projects undertaken by this team, 20 of the last 50 have been unsuccessful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk — Too Risky

1 2 3 4 5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible — Very Responsible

1 2 3 4 5

How disappointed are you about the present conditions of the project?

Not Too Disappointed — Very Disappointed

1 2 3 4 5

How important do you think this decision is?

Not Very Important — Very Important

1 2 3 4 5

What is the likelihood you would fund the request?

Reject Request — Fund Request

1 2 3 4 5

At this point, what would be more important?

Minimise Losses — Maximise Gains

1 2 3 4 5 6 7

I have already invested so much it seems foolish not to continue.

Strongly Disagree — Strongly Agree

1 2 3 4 5 6 7

Responsibility for the success of the project is

Out of my Control — Under my Control

1 2 3 4 5 6 7

Please mentally, conjure up two images of this project, a "current image" (reflecting conditions as they are now) and a "target image" (the way you would eventually like them to be).

How close is the "current image" to the "target image"?

Not Very Close — Very Close

1 2 3 4 5 6 7 8 9

Is your "current image" of this project moving toward your "target image"?

Definitely Not — Absolutely

1 2 3 4 5 6 7 8 9

Given your "current image" of this project, what is the likelihood that your "target image" will be realised?

Very Likely — Not Very Likely

1 2 3 4 5 6 7 8 9

In terms of "ultimate" project objectives, how well is the project doing?

Not Very Well — Very Well

1 2 3 4 5 6 7 8 9

It is time to make a decision. How much additional funding, if any, would you provide for the request. (from nil to any amount up to $100,000) please specify: _ _ _ _ _ _ _ _ _ _ _ _ _ _

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Version 2

As a fund manager, one of your project teams has come to you requesting an additional $100,000 in funds for an investment project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team remains confident it will be a success and well worth the investment.

You currently have $500,000 remaining in your budget that is unallocated. These funds must carry you for the rest of the financial year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities. Evaluating the situation, you believe there is a fair chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the investment projects undertaken by this team, 30 of the last 50 have been successful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk — Too Risky

1 2 3 4 5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible — Very Responsible

1 2 3 4 5

How disappointed are you about the present conditions of the project?

Not Too Disappointed — Very Disappointed

1 2 3 4 5

How important do you think this decision is?

Not Very Important — Very Important

1 2 3 4 5

What is the likelihood you would fund the request?

Reject Request — Fund Request

1 2 3 4 5

At this point, what would be more important?

Minimise Losses — Maximise Gains

1 2 3 4 5 6 7

I have already invested so much it seems foolish not to continue.

Strongly Disagree — Strongly Agree

1 2 3 4 5 6 7

Responsibility for the success of the project is

Out of my Control — Under my Control

1 2 3 4 5 6 7

Please mentally, conjure up two images of this project, a "current image" (reflecting conditions as they are now) and a "target image" (the way you would eventually like them to be).

How close is the "current image" to the "target image"?

Not Very Close — Very Close

1 2 3 4 5 6 7 8 9

Is your "current image" of this project moving toward your "target image"?

Definitely Not — Absolutely

1 2 3 4 5 6 7 8 9

Given your "current image" of this project, what is the likelihood that your "target image" will be realised?

Very Likely — Not Very Likely

1 2 3 4 5 6 7 8 9

In terms of "ultimate" project objectives, how well is the project doing?

Not Very Well — Very Well

1 2 3 4 5 6 7 8 9

It is time to make a decision. How much additional funding, if any, would you provide for the request. (from nil to any amount up to $100,000) please specify: ______________

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Version 3

As a fund manager, one of your project teams has come to you requesting an additional $100,000 in funds for an investment project you instituted several months ago. The project is already behind schedule and over budget, $100,000 has already been spent. However, the team remains confident it will be a success and well worth the investment.

You currently have $500,000 remaining in your budget that is unallocated. These funds must carry you for the rest of the financial year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities. Evaluating the situation, you believe there is a fair chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the investment projects undertaken by this team, 20 of the last 50 have been unsuccessful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk — Too Risky

1 2 3 4 5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible — Very Responsible

1 2 3 4 5

How disappointed are you about the present conditions of the project?

Not Too Disappointed — Very Disappointed

1 2 3 4 5

How important do you think this decision is?

Not Very Important — Very Important

1 2 3 4 5

What is the likelihood you would fund the request?

Reject Request — Fund Request

1 2 3 4 5

At this point, what would be more important?

Minimise Losses — Maximise Gains

1 2 3 4 5 6 7

I have already invested so much it seems foolish not to continue.

Strongly Disagree — Strongly Agree

1 2 3 4 5 6 7

Responsibility for the success of the project is

Out of my Control — Under my Control

1 2 3 4 5 6 7

Please mentally, conjure up two images of this project, a "current image" (reflecting conditions as they are now) and a "target image" (the way you would eventually like them to be).

How close is the "current image" to the "target image"?

Not Very Close — Very Close

1 2 3 4 5 6 7 8 9

Is your "current image" of this project moving toward your "target image"?

Definitely Not — Absolutely

1 2 3 4 5 6 7 8 9

Given your "current image" of this project, what is the likelihood that your "target image" will be realised?

Very Likely — Not Very Likely

1 2 3 4 5 6 7 8 9

In terms of "ultimate" project objectives, how well is the project doing?

Not Very Well — Very Well

1 2 3 4 5 6 7 8 9

It is time to make a decision. How much additional funding, if any, would you provide for the request. (from nil to any amount up to $100,000) please specify: ______________

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Appendix C

Accountants

Letter of Remittal

12th October, 2000

"Manager"
"Membership"
"Company"
"Street"
"City' "State""Postcode"

Dear Sir/ Madam,

This letter is to invite your co-operation in a research study concerning financial decision making. I am undertaking this study for completion of a PhD, through the University of Wollongong. The providing of financial advice and investment appraisal is an area of growing concern in the accounting profession. The potential consequences, both positive and negative, of a decision based on financial information are often very large. The purpose of this study is to examine the general attitudes in financial decision-making.

I request that you, or an appropriate officer, complete the attached questionnaire and return it to me at your earliest convenience. I realise that you have many demands on your time, and this should take less than ten minutes to complete. Please consider only the circumstances described, even if they appear simplistic. You are not required to disclose any information of a confidential nature and only grouped data will be used in the analysis process.

This survey is part of a controlled experiment. All responses to the questionnaire will be kept strictly confidential. If you have any questions, please feel free to phone me on (07) 5430-1263.

It would be appreciated if you can complete and return the questionnaire by the 14th November. A pre-paid self-addressed envelope is enclosed for your convenience.

Thank you for your time and co-operation in this research study.

Yours sincerely,

Greg Laing
"Membership"

Reminder Card

"Manager"
"Company"

Just a short note to remind you that the questionnaire I sent to you on the 12th October is important.

Please excuse this reminder if you have already returned your questionnaire.

Thank you
Greg Laing

Follow-up Letter

28th November, 2000

"Manager"
"Membership"
"Company"
"Street"
"City' "State""Postcode"

Dear Sir/ Madam,

Further to my letter, of the 12th October, regarding a survey of decision making. Perhaps you were not the person to whom the questionnaire should have been addressed, and you may have delegated the matter or perhaps the questionnaire has been misplaced or lost in the mail. At any rate, I am enclosing another questionnaire and reply paid envelope for your convenience. Would you please complete the survey and return it in the envelope provided, by the 12th December.

Thank you for your time and co-operation and should you have any questions please contact me by phone on (07) 5430-1263, fax (07) 5430-1212 or email glaing@usc.edu.au.

Yours faithfully,

Gregory K. Laing

Version 1

X1

This research is concerned with decision-making all details are strictly confidential and only grouped data will be used for reporting purposes.

Please read the following scenario and then complete the requirements.

Trusty Insurance Company is considering the elimination of its payroll department. Management has received an offer from an outside firm to process all of Trusty's payroll. The cost of running the payroll department includes $9,100 for rent per annum for floor space. If the payroll department is eliminated, the freed space will be used to store insurance files, currently in storage at a near by warehouse costing $11,000 per year.

The cost of operating the payroll department is $120,000 wages and $13,000 for overheads all of these are avoidable costs. The office furniture and equipment, in this department, has a book value of $30,000. Offers, to buy, have been received from three firms and the best valuation will result in a $20,000 loss on disposal.

The external payroll firm has made a submission to provide the payroll services for the next three years at a fixed price of $134,000 per annum.

REQUIRED:

Please rate your attitude to outsourcing the payroll function:

Very Negative 1	2	3	4	5	6	Very Positive 7

Please indicate your recommendation:

Option A ☐ Trusty Insurance Company should continue to operate the payroll department.

Option B ☐ Accept the offer and outsource the payroll function.

Please indicate how sure you are of your decision to outsource or not to outsource the payroll function:

Certain it should be Internal 1	2	3	4	5	6	Certain it should be External 7

In general do you consider yourself to be:

A rational Decision Maker 1	2	3	4	5	6	An Intuitive Decision Maker 7

Please turn the page over.

As R&D manager, one of your project teams has come to you requesting an additional $100,000 in funds for a project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team still believes it can be successfully completed. You currently have $500,000 remaining in your budget unallocated, but this must carry you for the rest of the fiscal year. Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities.
Evaluating the situation, you believe there is a fair chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the projects undertaken by this team, 30 of the last 50 have been successful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk				Too Risky
1	2	3	4	5

How disappointed are you about the present conditions of the project?

Not Too Disappointed				Very Disappointed
1	2	3	4	5

How important do you think this decision is?

Not Very Important				Very Important
1	2	3	4	5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible				Very Responsible
1	2	3	4	5

I want to minimise the amount of loss from the initial allocation.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I have already invested so much it seems foolish not to continue.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Responsibility for the success of the project is

Out of my Control						Under my Control
1	2	3	4	5	6	7

What is the likelihood you would fund the request?

Reject Request				Fund Request
1	2	3	4	5

How much, if any, would you provide in funds for the request.
(from nil to any amount up to $100,000) please specify ~ ______________

Please briefly list any other factors which influenced you in this decision?

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Version 2

X2

This research is concerned with decision-making all details are strictly confidential and only grouped data will be used for reporting purposes.

Please read the following scenario and then complete the requirements.

Trusty Insurance Company is considering the elimination of its payroll department. Management has received an offer from an outside firm to process all of Trusty's payroll. The cost of running the payroll department includes $9,100 for rent per annum for floor space. If the payroll department is eliminated, the freed space will be used to store insurance files, currently in storage at a near by warehouse costing $11,000 per year.

The cost of operating the payroll department is $120,000 wages and $13,000 for overheads all of these are avoidable costs. The office furniture and equipment, in this department, has a book value of $30,000. Offers, to buy, have been received from three firms and the best valuation will result in a $20,000 loss on disposal.

The external payroll firm has made a submission to provide the payroll services for the next three years at a fixed price of $134,000 per annum.

REQUIRED:

Please rate your attitude to outsourcing the payroll function:

Very Negative						Very Positive
1	2	3	4	5	6	7

Please indicate your recommendation:

Option A ☐ Trusty Insurance Company should continue to operate the payroll department.

Option B ☐ Accept the offer and outsource the payroll function.

Please indicate how sure you are of your decision to outsource or not to outsource the payroll function:

Certain it should be Internal						Certain it should be External
1	2	3	4	5	6	7

In general do you consider yourself to be:

A rational Decision Maker						An Intuitive Decision Maker
1	2	3	4	5	6	7

Please turn the page over.

As R&D manager, one of your project teams has come to you requesting an additional $100,000 in funds for a project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team still believes it can be successfully completed. You currently have $500,000 remaining in your budget unallocated, but this must carry you for the rest of the fiscal year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities.
Evaluating the situation, you believe there is a moderate chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the projects undertaken by this team, 30 of the last 50 have been successful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk				Too Risky
1	2	3	4	5

How disappointed are you about the present conditions of the project?

Not Too Disappointed				Very Disappointed
1	2	3	4	5

How important do you think this decision is?

Not Very Important				Very Important
1	2	3	4	5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible				Very Responsible
1	2	3	4	5

I want to minimise the amount of loss from the initial allocation.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I have already invested so much it seems foolish not to continue.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Responsibility for the success of the project is

Out of my Control						Under my Control
1	2	3	4	5	6	7

What is the likelihood you would fund the request?

Reject Request				Fund Request
1	2	3	4	5

How much, if any, would you provide in funds for the request.
(from nil to any amount up to $100,000) please specify ~ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Please briefly list any other factors which influenced you in this decision?

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Version 3

Y1

This research is concerned with decision-making all details are strictly confidential and only grouped data will be used for reporting purposes.

Please read the following scenario and then complete the requirements.

Trusty Insurance Company is considering the elimination of its payroll department. Management has received an offer from an outside firm to process all of Trusty's payroll. The cost of running the payroll department includes $9,100 for rent per annum for floor space. If the payroll department is eliminated, the freed space will be used to store insurance files, currently in storage at a near by warehouse costing $11,000 per year.

The cost of operating the payroll department is $120,000 wages and $13,000 for overheads all of these are avoidable costs. The office furniture and equipment, in this department, has a book value of $30,000. Offers, to buy, have been received from three firms and the best valuation will realise $10,000 on disposal.

The external payroll firm has made a submission to provide the payroll services for the next three years at a fixed price of $134,000 per annum.

REQUIRED:

Please rate your attitude to outsourcing the payroll function:

Very Negative						Very Positive
1	2	3	4	5	6	7

Please indicate your recommendation:

Option A ☐ Trusty Insurance Company should continue to operate the payroll department.

Option B ☐ Accept the offer and outsource the payroll function.

Please indicate how sure you are of your decision to outsource or not to outsource the payroll function:

Certain it should be Internal						Certain it should be External
1	2	3	4	5	6	7

In general do you consider yourself to be:

A rational Decision Maker						An Intuitive Decision Maker
1	2	3	4	5	6	7

Please turn the page over.

As R&D manager, one of your project teams has come to you requesting an additional $100,000 in funds for a project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team still believes it can be successfully completed. You currently have $500,000 remaining in your budget unallocated, but this must carry you for the rest of the fiscal year. Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities.
Evaluating the situation, you believe there is a fair chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the projects undertaken by this team, 20 of the last 50 have been unsuccessful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk				Too Risky
1	2	3	4	5

How disappointed are you about the present conditions of the project?

Not Too Disappointed				Very Disappointed
1	2	3	4	5

How important do you think this decision is?

Not Very Important				Very Important
1	2	3	4	5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible				Very Responsible
1	2	3	4	5

I want to minimise the amount of loss from the initial allocation.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I have already invested so much it seems foolish not to continue.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Responsibility for the success of the project is

Out of my Control						Under my Control
1	2	3	4	5	6	7

What is the likelihood you would fund the request?

Reject Request				Fund Request
1	2	3	4	5

How much, if any, would you provide in funds for the request.
(from nil to any amount up to $100,000) please specify ~ ______________

Please briefly list any other factors which influenced you in this decision?

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Version 4

Y2

This research is concerned with decision-making all details are strictly confidential and only grouped data will be used for reporting purposes.

Please read the following scenario and then complete the requirements.

Trusty Insurance Company is considering the elimination of its payroll department. Management has received an offer from an outside firm to process all of Trusty's payroll. The cost of running the payroll department includes $9,100 for rent per annum for floor space. If the payroll department is eliminated, the freed space will be used to store insurance files, currently in storage at a near by warehouse costing $11,000 per year.

The cost of operating the payroll department is $120,000 wages and $13,000 for overheads all of these are avoidable costs. The office furniture and equipment, in this department, has a book value of $30,000. Offers, to buy, have been received from three firms and the best valuation will realise $10,000 on disposal.

The external payroll firm has made a submission to provide the payroll services for the next three years at a fixed price of $134,000 per annum.

REQUIRED:

Please rate your attitude to outsourcing the payroll function:

Very Negative						Very Positive
1	2	3	4	5	6	7

Please indicate your recommendation:

Option A ☐ Trusty Insurance Company should continue to operate the payroll department.

Option B ☐ Accept the offer and outsource the payroll function.

Please indicate how sure you are of your decision to outsource or not to outsource the payroll function:

Certain it should be Internal						Certain it should be External
1	2	3	4	5	6	7

In general do you consider yourself to be:

A rational Decision Maker						An Intuitive Decision Maker
1	2	3	4	5	6	7

Please turn the page over.

As R&D manager, one of your project teams has come to you requesting an additional $100,000 in funds for a project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team still believes it can be successfully completed. You currently have $500,000 remaining in your budget unallocated, but this must carry you for the rest of the fiscal year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities.
Evaluating the situation, you believe there is a moderate chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the projects undertaken by this team, 20 of the last 50 have been unsuccessful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk				Too Risky
1	2	3	4	5

How disappointed are you about the present conditions of the project?

Not Too Disappointed				Very Disappointed
1	2	3	4	5

How important do you think this decision is?

Not Very Important				Very Important
1	2	3	4	5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible				Very Responsible
1	2	3	4	5

I want to minimise the amount of loss from the initial allocation.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I have already invested so much it seems foolish not to continue.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Responsibility for the success of the project is

Out of my Control						Under my Control
1	2	3	4	5	6	7

What is the likelihood you would fund the request?

Reject Request				Fund Request
1	2	3	4	5

How much, if any, would you provide in funds for the request.
(from nil to any amount up to $100,000) please specify ~ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Please briefly list any other factors which influenced you in this decision?

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION Y3

Version 5

Z1

This research is concerned with decision-making all details are strictly confidential and only grouped data will be used for reporting purposes.

Please read the following scenario and then complete the requirements.

Trusty Insurance Company is considering the elimination of its payroll department. Management has received an offer from an outside firm to process all of Trusty's payroll. The cost of running the payroll department includes $9,100 for rent per annum for floor space. If the payroll department is eliminated, the freed space will be used to store insurance files, currently in storage at a near by warehouse costing $11,000 per year.

The cost of operating the payroll department is $120,000 wages and $13,000 for overheads all of these are avoidable costs.

The external payroll firm has made a submission to provide the payroll services for the next three years at a fixed price of $134,000 per annum. There are no additional costs or investments required.

REQUIRED:

Please rate your attitude to outsourcing the payroll function:

Very Negative						Very Positive
1	2	3	4	5	6	7

Please indicate your recommendation:

Option A ☐ Trusty Insurance Company should continue to operate the payroll department.

Option B ☐ Accept the offer and outsource the payroll function.

Please indicate how sure you are of your decision to outsource or not to outsource the payroll function:

Certain it should be Internal						Certain it should be External
1	2	3	4	5	6	7

In general do you consider yourself to be:

A rational Decision Maker						An Intuitive Decision Maker
1	2	3	4	5	6	7

Please turn the page over.

As R&D manager, one of your project teams has come to you requesting an additional $100,000 in funds for a project you instituted several months ago. The project is already behind schedule and over budget, $400,000 has already been spent. However, the team still believes it can be successfully completed. You currently have $500,000 remaining in your budget unallocated, but this must carry you for the rest of the fiscal year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities.
Evaluating the situation, you believe there is a moderate chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the projects undertaken by this team, 30 of the last 50 have been successful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk				Too Risky
1	2	3	4	5

How disappointed are you about the present conditions of the project?

Not Too Disappointed				Very Disappointed
1	2	3	4	5

How important do you think this decision is?

Not Very Important				Very Important
1	2	3	4	5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible				Very Responsible
1	2	3	4	5

I want to minimise the amount of loss from the initial allocation.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I have already invested so much it seems foolish not to continue.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Responsibility for the success of the project is

Out of my Control						Under my Control
1	2	3	4	5	6	7

What is the likelihood you would fund the request?

Reject Request				Fund Request
1	2	3	4	5

How much, if any, would you provide in funds for the request.
(from nil to any amount up to $100,000) please specify ~ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Please briefly list any other factors which influenced you in this decision?

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Version 6

Z2

This research is concerned with decision-making all details are strictly confidential and only grouped data will be used for reporting purposes.

Please read the following scenario and then complete the requirements.

Trusty Insurance Company is considering the elimination of its payroll department. Management has received an offer from an outside firm to process all of Trusty's payroll. The cost of running the payroll department includes $9,100 for rent per annum for floor space. If the payroll department is eliminated, the freed space will be used to store insurance files, currently in storage at a near by warehouse costing $11,000 per year.

The cost of operating the payroll department is $120,000 wages and $13,000 for overheads all of these are avoidable costs.

The external payroll firm has made a submission to provide the payroll services for the next three years at a fixed price of $134,000 per annum. To produce the payroll slips would require the purchase of a special machine for $500. However, this equipment could not be used if the company changes to another external provider and would have no resale value.

REQUIRED:

Please rate your attitude to outsourcing the payroll function:

Very Negative 1	2	3	4	5	6	Very Positive 7

Please indicate your recommendation:

Option A ☐ Trusty Insurance Company should continue to operate the payroll department.

Option B ☐ Accept the offer and outsource the payroll function.

Please indicate how sure you are of your decision to outsource or not to outsource the payroll function:

Certain it should be Internal 1	2	3	4	5	6	Certain it should be External 7

In general do you consider yourself to be:

A rational Decision Maker 1	2	3	4	5	6	An Intuitive Decision Maker 7

Please turn the page over.

As R&D manager, one of your project teams has come to you requesting an additional $100,000 in funds for a project you instituted several months ago. The project is already behind schedule and over budget, $100,000 has already been spent. However, the team still believes it can be successfully completed. You currently have $500,000 remaining in your budget unallocated, but this must carry you for the rest of the fiscal year (6 months). Lowering the balance by an additional $100,000 might jeopardise flexibility to respond to other opportunities.
Evaluating the situation, you believe there is a moderate chance the project will not succeed, in which case the additional funding would be lost; if successful, however, the money would be well spent.

Of the projects undertaken by this team, 20 of the last 50 have been unsuccessful.

In regards to this decision please circle the number which represents your response to each of the following:

Indicate the level of risk you believe is associated with providing the additional funds.

No Risk				Too Risky
1	2	3	4	5

How disappointed are you about the present conditions of the project?

Not Too Disappointed				Very Disappointed
1	2	3	4	5

How important do you think this decision is?

Not Very Important				Very Important
1	2	3	4	5

How responsible do you feel for the initial decision to undertake the project?

Not Very Responsible				Very Responsible
1	2	3	4	5

I want to minimise the amount of loss from the initial allocation.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

I have already invested so much it seems foolish not to continue.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

Responsibility for the success of the project is

Out of my Control						Under my Control
1	2	3	4	5	6	7

What is the likelihood you would fund the request?

Reject Request				Fund Request
1	2	3	4	5

How much, if any, would you provide in funds for the request.
(from nil to any amount up to $100,000) please specify ~ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Please briefly list any other factors which influenced you in this decision?

END OF QUESTIONNAIRE
THANK YOU FOR YOUR TIME AND CO-OPERATION

Appendix D

Supporting Statistics for Chapter 5

Table 5.2a
Analysis of Early Late Responses ~ Public Hospitals

EARLT * INOUT Crosstabulation

Count

		INOUT		Total
		1	2	
EARLT	1	64	37	101
	2	14	13	27
Total		78	50	128

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.187[b]	1	.276		
Continuity Correction[a]	.752	1	.386		
Likelihood Ratio	1.169	1	.280		
Fisher's Exact Test				.375	.192
Linear-by-Linear Association	1.177	1	.278		
N of Valid Cases	128				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.55.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
EARLT * INOUT	128	100.0%	0	.0%	128	100.0%

Table 5.3a
Analysis of Early Late Responses ~ Private Hospitals

EARLT * INOUT Crosstabulation

Count

		INOUT		
		1	2	Total
EARLT	1	38	18	56
	2	19	14	33
Total		57	32	89

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.953[b]	1	.329		
Continuity Correction[a]	.559	1	.455		
Likelihood Ratio	.946	1	.331		
Fisher's Exact Test				.366	.227
Linear-by-Linear Association	.942	1	.332		
N of Valid Cases	89				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.87.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
EARLT * INOUT	89	100.0%	0	.0%	89	100.0%

Table 5.6a
Crosstabulation of Outsourcing Decision * Sunk Cost/No Sunk Cost

Sunk cost	*Outsource*		
	No	Yes	Total
No (AB)	40	41	81
Yes (CDEF)	95	41	136
Total	135	82	217

Result: χ^2 sample = 9.049 (α =0.003, df = 1)

Decision: **Reject the null hypothesis.**

Computed χ^2 exceeds the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.049[b]	1	.003		
Continuity Correction[a]	8.199	1	.004		
Likelihood Ratio	8.979	1	.003		
Fisher's Exact Test				.004	.002
Linear-by-Linear Association	9.007	1	.003		
N of Valid Cases	217				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 30.61.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.204	.003
	Cramer's V	.204	.003
	Contingency Coefficient	.200	.003
N of Valid Cases		217	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.8a
Crosstabulation of Outsourcing Decision * Sunk Cost High/Low

Sunk cost	*Outsource*		
	No	Yes	Total
High (CD)	61	13	74
Low (EF)	34	28	62
Total	95	41	136

Result: χ^2 sample = 12.198 (α =0.000, df = 1)

Decision: **Reject the null hypothesis.**

Computed χ^2 exceeds the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.198[b]	1	.000		
Continuity Correction[a]	10.922	1	.001		
Likelihood Ratio	12.338	1	.000		
Fisher's Exact Test				.001	.000
Linear-by-Linear Association	12.108	1	.001		
N of Valid Cases	136				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.69.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.299	.000
	Cramer's V	.299	.000
	Contingency Coefficient	.287	.000
N of Valid Cases		136	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.9a
Crosstabulation of Outsourcing Decision * Asset Specificity No/Yes

Asset Specificity	*Outsource*		
	No	Yes	Total
No (ACE)	60	54	114
Yes (BDF)	75	28	103
Total	135	82	217

Result: χ^2 sample = 9.377 (α =0.002, df = 1)

Decision: **Reject the null hypothesis.**

Computed χ^2 exceeds the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.377[b]	1	.002		
Continuity Correction[a]	8.538	1	.003		
Likelihood Ratio	9.500	1	.002		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	9.334	1	.002		
N of Valid Cases	217				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 38.92.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.208	.002
	Cramer's V	.208	.002
	Contingency Coefficient	.204	.002
N of Valid Cases		217	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.10a
Crosstabulation of Outsourcing Decision * Private/Public Hospitals

Hospitals	*Outsource*		
	No	Yes	Total
Public	78	50	128
Private	57	32	89
Total	135	82	217

Result: χ^2 sample = 0.216 (α =0.642, df = 1)

Decision: **Cannot reject the null hypothesis.**

Computed χ^2 **does not** exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.216[b]	1	.642		
Continuity Correction[a]	.104	1	.747		
Likelihood Ratio	.216	1	.642		
Fisher's Exact Test				.671	.374
Linear-by-Linear Association	.215	1	.643		
N of Valid Cases	217				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 33.63.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.032	.642
	Cramer's V	.032	.642
	Contingency Coefficient	.032	.642
N of Valid Cases		217	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.11a
Crosstabulation of Outsourcing Decision * Size of Hospital

Size measured by number of beds	*Outsource* No	Yes	Total
Lowest - 100	97	50	147
101 – 200	19	13	32
201 – 300	7	10	17
301 to highest	12	9	21
Total	135	82	217

Result: χ^2 sample = 4.430 (α =0.219, df = 3)

Decision: **Cannot reject the null hypothesis.**

Computed χ^2 **does not** exceed the critical value: χ^2 critical = 7.815 (α =0.05, df = 3)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.430[a]	3	.219
Likelihood Ratio	4.312	3	.230
Linear-by-Linear Association	2.526	1	.112
N of Valid Cases	217		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.42.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.143	.219
	Cramer's V	.143	.219
	Contingency Coefficient	.141	.219
N of Valid Cases		217	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.12a
Crosstabulation of Outsourcing Decision * Years of Experience

Years of experience	*Outsource* No	Yes	Total
Lowest – 5	26	15	41
6 - 10	35	30	65
11 – 15	30	18	48
16 – 20	22	13	35
21 – 25	13	4	17
26 - highest	8	2	10
Total	134	82	216

Result: χ^2 sample = 4.773 (α =0.444, df = 5)

Decision: **Cannot reject the null hypothesis.**

Computed χ^2 **does not** exceed the critical value**:** χ^2 critical = 12.832 (α =0.05, df = 5)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.773[a]	5	.444
Likelihood Ratio	4.975	5	.419
Linear-by-Linear Association	2.244	1	.134
N of Valid Cases	216		

a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 3.80.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.149	.444
	Cramer's V	.149	.444
	Contingency Coefficient	.147	.444
N of Valid Cases		216	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.13a
Crosstabulation of Outsourcing Decision * Previously Considered Outsourcing No/Yes

Previously considered O/S	Outsource		
	No	Yes	Total
No	25	13	38
Yes	110	69	179
Total	135	82	217

Result: χ^2 sample = 0.251 (α =0.617, df = 1)

Decision: **Cannot reject the null hypothesis.**

Computed χ^2 **does not** exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.251[b]	1	.617		
Continuity Correction[a]	.100	1	.752		
Likelihood Ratio	.253	1	.615		
Fisher's Exact Test				.714	.379
Linear-by-Linear Association	.250	1	.617		
N of Valid Cases	217				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.36.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.034	.617
	Cramer's V	.034	.617
	Contingency Coefficient	.034	.617
N of Valid Cases		217	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.14a
Crosstabulation of Outsourcing Decision * Previously Considered Outsourcing * Previous Decision to Outsource No/Yes (Public Hospitals)

Previously considered O/S	*Outsource* No	Yes	Total
Prev Dec No	26	10	36
Prev Dec Yes	34	30	64
Total	60	40	100

Public Hospitals χ^2 sample = 3.501 (α =0.061, df = 1) **Cannot reject the null hypothesis.**

Chi-Square Tests

PREV		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
1	Pearson Chi-Square	3.501[b]	1	.061		
	Continuity Correction[a]	2.751	1	.097		
	Likelihood Ratio	3.589	1	.058		
	Fisher's Exact Test				.088	.048
	Linear-by-Linear Association	3.466	1	.063		
	N of Valid Cases	100				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.40.

Symmetric Measures

PREV			Value	Approx. Sig.
1	Nominal by Nominal	Phi	-.187	.061
		Cramer's V	.187	.061
		Contingency Coefficient	.184	.061
	N of Valid Cases		100	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.15a
Crosstabulation of Outsourcing Decision * Previously Considered Outsourcing * Previous Decision to Outsource No/Yes (Private Hospitals)

Previously considered O/S	*Outsource* No	Yes	Total
Prev Dec No	19	12	31
Prev Dec Yes	30	17	47
Total	49	29	78

Private Hospitals χ^2 sample = 0.052 (α =0.820, df = 1) **Cannot reject the null hypothesis.**

Chi-Square Tests

PREV		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
1	Pearson Chi-Square	.052[b]	1	.820		
	Continuity Correction[a]	.000	1	1.000		
	Likelihood Ratio	.051	1	.820		
	Fisher's Exact Test				1.000	.503
	Linear-by-Linear Association	.051	1	.821		
	N of Valid Cases	78				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.53.

Symmetric Measures

PREV			Value	Approx. Sig.
1	Nominal by Nominal	Phi	.026	.820
		Cramer's V	.026	.820
		Contingency Coefficient	.026	.820
	N of Valid Cases		78	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.18a
Crosstabulation of Outsourcing Decision * Gender

Gender	*Outsource*		
	No	Yes	Total
Female	64	41	105
Male	70	40	110
Total	13	81	215

Result: χ^2 sample = 0.165 (α =0.685, df = 1)

Decision: **Cannot reject the null hypothesis.**

Computed χ^2 **does not** exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.165[b]	1	.685		
Continuity Correction[a]	.070	1	.791		
Likelihood Ratio	.165	1	.685		
Fisher's Exact Test				.778	.395
Linear-by-Linear Association	.164	1	.685		
N of Valid Cases	215				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 39.56.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.028	.685
	Cramer's V	.028	.685
	Contingency Coefficient	.028	.685
N of Valid Cases		215	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.20a
Crosstabulation of Outsourcing Decision * Gender (Public Hospitals)

Gender	*Outsource*		
	No	Yes	Total
Female	41	36	77
Male	26	24	50
Total	67	60	217

Public Hospitals χ^2 sample = 0.019 (α =0.891, df = 1) **Cannot reject the null hypothesis.**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.019[b]	1	.891		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.019	1	.891		
Fisher's Exact Test				1.000	.517
Linear-by-Linear Association	.019	1	.891		
N of Valid Cases	127				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.62.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.012	.891
	Cramer's V	.012	.891
	Contingency Coefficient	.012	.891
N of Valid Cases		127	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 5.21a
Crosstabulation of Outsourcing Decision * Gender (Private Hospitals)

Gender	*Outsource*		
	No	Yes	Total
Female	23	34	57
Male	15	16	31
Total	38	50	88

Private Hospitals χ^2 sample = 0.529 (α =0.467, df = 1) Cannot reject the null hypothesis.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.529[b]	1	.467		
Continuity Correction[a]	.252	1	.616		
Likelihood Ratio	.527	1	.468		
Fisher's Exact Test				.505	.307
Linear-by-Linear Association	.523	1	.470		
N of Valid Cases	88				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.39.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.077	.467
	Cramer's V	.077	.467
	Contingency Coefficient	.077	.467
N of Valid Cases		88	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Appendix E

Supporting Statistics for Chapter 6

Table 6.3a
Analysis of Early Late Responses

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RISK	Equal variances assumed	.440	.509	-1.165	84	.247	-.39	.33	-1.05	.27
	Equal variances not assumed			-.981	10.575	.348	-.39	.39	-1.26	.49
RESP	Equal variances assumed	.183	.670	-1.335	84	.185	-.59	.44	-1.46	.29
	Equal variances not assumed			-1.373	11.698	.195	-.59	.43	-1.52	.35
DISAP	Equal variances assumed	1.918	.170	-1.864	84	.066	-.69	.37	-1.42	4.60E-02
	Equal variances not assumed			-1.532	10.472	.155	-.69	.45	-1.69	.31
IMPORT	Equal variances assumed	5.045	.027	-1.294	84	.199	-.48	.37	-1.22	.26
	Equal variances not assumed			-1.799	15.393	.092	-.48	.27	-1.05	8.76E-02
LIKELY	Equal variances assumed	.009	.926	-1.217	84	.227	-.39	.32	-1.04	.25
	Equal variances not assumed			-1.125	11.026	.284	-.39	.35	-1.17	.38
MINI	Equal variances assumed	1.536	.219	1.884	84	.063	.80	.42	-4.42E-02	1.64
	Equal variances not assumed			2.296	13.319	.039	.80	.35	4.88E-02	1.55
SUNK	Equal variances assumed	.001	.973	-.849	84	.398	-.39	.46	-1.31	.53
	Equal variances not assumed			-.825	11.318	.426	-.39	.48	-1.43	.65
CONTROL	Equal variances assumed	1.483	.227	.365	84	.716	.19	.52	-.84	1.22
	Equal variances not assumed			.426	12.830	.677	.19	.45	-.77	1.15
CLOSE	Equal variances assumed	4.780	.032	1.175	84	.243	.66	.56	-.46	1.78
	Equal variances not assumed			.881	10.146	.399	.66	.75	-1.01	2.33
MOVING	Equal variances assumed	2.990	.087	1.215	84	.228	.59	.49	-.38	1.56
	Equal variances not assumed			.988	10.432	.345	.59	.60	-.74	1.92
GIVEN	Equal variances assumed	5.913	.017	.665	84	.508	.39	.59	-.77	1.55
	Equal variances not assumed			.522	10.296	.613	.39	.75	-1.27	2.05
TERMS	Equal variances assumed	6.790	.011	1.060	84	.292	.66	.63	-.58	1.91
	Equal variances not assumed			.772	10.054	.458	.66	.86	-1.25	2.58
AMT	Equal variances assumed	6.130	.015	1.024	84	.309	9184.21	8968.14	-8649.92	27018.34
	Equal variances not assumed			.764	10.129	.462	9184.21	12022.71	-17557.93	35926.35

Table 6.7a
ANOVA Details of Investment Task

ANOVA

AMT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.21E+09	2	3106817187	4.755	.011
Within Groups	5.42E+10	83	653436178.7		
Total	6.04E+10	85			

Multiple Comparisons

Dependent Variable: AMT

	(I) PAPER	(J) PAPER	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Scheffe	1	2	-14130.01	6393.72	.093	-30066.95	1806.93
		3	-20872.43*	7126.02	.017	-38634.71	-3110.16
	2	1	14130.01	6393.72	.093	-1806.93	30066.95
		3	-6742.42	7035.82	.633	-24279.85	10795.00
	3	1	20872.43*	7126.02	.017	3110.16	38634.71
		2	6742.42	7035.82	.633	-10795.00	24279.85
LSD	1	2	-14130.01*	6393.72	.030	-26846.87	-1413.15
		3	-20872.43*	7126.02	.004	-35045.81	-6699.06
	2	1	14130.01*	6393.72	.030	1413.15	26846.87
		3	-6742.42	7035.82	.341	-20736.38	7251.54
	3	1	20872.43*	7126.02	.004	6699.06	35045.81
		2	6742.42	7035.82	.341	-7251.54	20736.38
Dunnett t (2-sided)[a]	1	3	-20872.43*	7126.02	.008	-36816.16	-4928.70
	2	3	-6742.42	7035.82	.518	-22484.33	8999.48

*. The mean difference is significant at the .05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

AMT

	PAPER	N	Subset for alpha = .05	
			1	2
Scheffe[a,b]	1	31	39354.84	
	2	33	53484.85	53484.85
	3	22		60227.27
	Sig.		.126	.619

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 27.774.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 6.8a
Means Testing of Perceived Responsibility and Multiple Comparisons

AMT

	RESP	N	Subset for alpha = .05 1	2
Scheffe[a,b]	1	15	36000.00	
	2	13	38461.54	
	3	20	52250.00	52250.00
	4	26	53076.92	53076.92
	5	12		70416.67
	Sig.		.452	.387

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 15.854.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 6.8b
Means Testing of Multiple Comparisons

Multiple Comparisons

Dependent Variable: AMT

	(I) RESP	(J) RESP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Scheffe	1	2	-2461.54	9455.02	.999	-32267.76	27344.69
		3	-16250.00	8522.64	.463	-43116.97	10616.97
		4	-17076.92	8090.22	.356	-42580.72	8426.88
		5	-34416.67*	9663.77	.018	-64880.94	-3952.39
	2	1	2461.54	9455.02	.999	-27344.69	32267.76
		3	-13788.46	8889.37	.663	-41811.52	14234.60
		4	-14615.38	8475.69	.565	-41334.32	12103.55
		5	-31955.13*	9988.69	.045	-63443.70	-466.56
	3	1	16250.00	8522.64	.463	-10616.97	43116.97
		2	13788.46	8889.37	.663	-14234.60	41811.52
		4	-826.92	7421.27	1.000	-24221.89	22568.05
		5	-18166.67	9111.09	.416	-46888.66	10555.33
	4	1	17076.92	8090.22	.356	-8426.88	42580.72
		2	14615.38	8475.69	.565	-12103.55	41334.32
		3	826.92	7421.27	1.000	-22568.05	24221.89
		5	-17339.74	8707.94	.417	-44790.84	10111.36
	5	1	34416.67*	9663.77	.018	3952.39	64880.94
		2	31955.13*	9988.69	.045	466.56	63443.70
		3	18166.67	9111.09	.416	-10555.33	46888.66
		4	17339.74	8707.94	.417	-10111.36	44790.84
LSD	1	2	-2461.54	9455.02	.795	-21274.07	16350.99
		3	-16250.00	8522.64	.060	-33207.38	707.38
		4	-17076.92*	8090.22	.038	-33173.93	-979.92
		5	-34416.67*	9663.77	.001	-53644.53	-15188.80
	2	1	2461.54	9455.02	.795	-16350.99	21274.07
		3	-13788.46	8889.37	.125	-31475.53	3898.60
		4	-14615.38	8475.69	.088	-31479.34	2248.57
		5	-31955.13*	9988.69	.002	-51829.49	-12080.77
	3	1	16250.00	8522.64	.060	-707.38	33207.38
		2	13788.46	8889.37	.125	-3898.60	31475.53
		4	-826.92	7421.27	.912	-15592.92	13939.07
		5	-18166.67*	9111.09	.050	-36294.87	-38.46
	4	1	17076.92*	8090.22	.038	979.92	33173.93
		2	14615.38	8475.69	.088	-2248.57	31479.34
		3	826.92	7421.27	.912	-13939.07	15592.92
		5	-17339.74*	8707.94	.050	-34665.81	-13.68
	5	1	34416.67*	9663.77	.001	15188.80	53644.53
		2	31955.13*	9988.69	.002	12080.77	51829.49
		3	18166.67*	9111.09	.050	38.46	36294.87
		4	17339.74*	8707.94	.050	13.68	34665.81
Dunnett t (2-sided) [a]	1	5	-34416.67*	9663.77	.002	-58218.09	-10615.24
	2	5	-31955.13*	9988.69	.007	-56556.82	-7353.44
	3	5	-18166.67	9111.09	.142	-40606.86	4273.53
	4	5	-17339.74	8707.94	.143	-38787.00	4107.51

*. The mean difference is significant at the .05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

Table 6.12a Multiple Regression – Funding Regressed on All Eight Problem-Space Measures (Negative~1)

	Measure	*F*	*dfs*	*MSe*	*R2*	*Adjusted R2*	*Standardised beta coefficients*
1	Funding	2.149	8, 22		.439	.235	
2	Intentions						0.504
3	Risk						-0.192
4	Disappointment						-0.215
5	Importance						0.020
6	Responsibility						0.162
7	Minimise loss						0.279
8	Sunk costs						-0.028
9	Control						-0.059

Model Summary

Model	R NEG1 = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.662[a]	.439	.235	19717.59

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, MINI, RESP, RISK, IMPORT, SUNK

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.68E+09	8	835483210.7	2.149	.074[a]
	Residual	8.55E+09	22	388783231.3		
	Total	1.52E+10	30			

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, MINI, RESP, RISK, IMPORT, SUNK

b. Dependent Variable: AMT

c. Selecting only cases for which NEG1 = 1

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10740.572	35653.475		.301	.766
	RISK	-4345.985	3948.057	-.192	-1.101	.283
	RESP	3136.347	3971.242	.162	.790	.438
	DISAP	-4789.343	4016.264	-.215	-1.192	.246
	IMPORT	408.423	4241.422	.020	.096	.924
	LIKELY	11438.632	4376.527	.504	2.614	.016
	MINI	4717.411	3677.199	.279	1.283	.213
	SUNK	-481.667	4319.070	-.028	-.112	.912
	CONTROL	-781.407	2565.557	-.059	-.305	.764

a. Dependent Variable: AMT

b. Selecting only cases for which NEG1 = 1

Table 6.13a Multiple Regression – Funding Regressed on All Eight Problem-Space Measures (Positive~ 2)

	Measure	*F*	*dfs*	*MSe*	*R2*	*Adjusted R2*	*Standardised beta coefficients*
1	Funding	5.122*	8, 24		.631	.507	
2	Intentions						0.248
3	Risk						-0.559
4	Disappointment						0.002
5	Importance						0.254
6	Responsibility						0.289
7	Minimise loss						0.193
8	Sunk costs						0.206
9	Control						-0.152

Significant at p < 0.001

Model Summary

Model	R POS2 = 2 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.631	.507	17966.99

a. Predictors: (Constant), CONTROL, RESP, DISAP, LIKELY, MINI, RISK, SUNK, IMPORT

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.32E+10	8	1653342486	5.122	.001[a]
	Residual	7.75E+09	24	322812605.8		
	Total	2.10E+10	32			

a. Predictors: (Constant), CONTROL, RESP, DISAP, LIKELY, MINI, RISK, SUNK, IMPORT

b. Dependent Variable: AMT

c. Selecting only cases for which POS2 = 2

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	28515.947	25306.924		1.127	.271
	RISK	-14295.1	3948.062	-.559	-3.621	.001
	RESP	5136.598	2709.256	.289	1.896	.070
	DISAP	54.633	4150.072	.002	.013	.990
	IMPORT	5970.578	4442.090	.254	1.344	.191
	LIKELY	6403.796	3515.198	.248	1.822	.081
	MINI	3676.696	3091.014	.193	1.189	.246
	SUNK	3814.836	2912.924	.206	1.310	.203
	CONTROL	-2483.824	2778.233	-.152	-.894	.380

a. Dependent Variable: AMT

b. Selecting only cases for which POS2 = 2

Table 6.14a Multiple Regression – Funding Regressed on All Eight Problem-Space Measures (Negative~ 3)

	Measure	*F*	*dfs*	*MSe*	*R2*	*Adjusted R2*	*Standardised beta coefficients*
1	Funding	3.223*	8, 13		.665	.459	
2	Intentions						0.358
3	Risk						-0.272
4	Disappointment						-0.329
5	Importance						-0.104
6	Responsibility						0.310
7	Minimise loss						0.233
8	Sunk costs						0.173
9	Control						-0.139

* Significant at p < 0.030

Model Summary

Model	R NEG2 = 3 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.815[a]	.665	.459	21556.78

a. Predictors: (Constant), CONTROL, RESP, RISK, SUNK, MINI, IMPORT, LIKELY, DISAP

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.20E+10	8	1497854000	3.223	.030[a]
	Residual	6.04E+09	13	464694741.2		
	Total	1.80E+10	21			

a. Predictors: (Constant), CONTROL, RESP, RISK, SUNK, MINI, IMPORT, LIKELY, DISAP

b. Dependent Variable: AMT

c. Selecting only cases for which NEG2 = 3

Coefficients[a,b]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	33054.295	41551.878		.795	.441
	RISK	-8510.626	6952.072	-.272	-1.224	.243
	RESP	7020.810	4614.938	.310	1.521	.152
	DISAP	-7579.861	5454.087	-.329	-1.390	.188
	IMPORT	-2615.068	5321.325	-.104	-.491	.631
	LIKELY	11493.500	6873.369	.358	1.672	.118
	MINI	6446.370	4887.593	.233	1.319	.210
	SUNK	5416.829	7164.254	.173	.756	.463
	CONTROL	-3176.039	4363.357	-.139	-.728	.480

a. Dependent Variable: AMT

b. Selecting only cases for which NEG2 = 3

Table 6.17a
Multiple Regression Details for Problem Space and Image Compatibility

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.709[a]	.503	.451	19758.86

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.04E+10	8	3798382587	9.729	.000[a]
	Residual	3.01E+10	77	390412682.0		
	Total	6.04E+10	85			

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

b. Dependent Variable: AMT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	19417.726	17180.627		1.130	.262
	RISK	-9177.976	2490.374	-.341	-3.685	.000
	RESP	5730.803	1817.295	.282	3.153	.002
	DISAP	-4018.821	2280.743	-.168	-1.762	.082
	IMPORT	2638.490	2288.932	.110	1.153	.253
	LIKELY	7457.710	2379.055	.271	3.135	.002
	MINI	4542.053	1900.141	.217	2.390	.019
	SUNK	4754.975	1878.940	.244	2.531	.013
	CONTROL	-2022.876	1519.025	-.117	-1.332	.187

a. Dependent Variable: AMT

Table 6.18a
Multiple Regression Details for Problem Space and Image Compatibility (Collapsed)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.945[a]	.893	.882	.79

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	400.362	8	50.045	80.244	.000[a]
	Residual	48.022	77	.624		
	Total	448.384	85			

a. Predictors: (Constant), CONTROL, RISK, LIKELY, RESP, MINI, IMPORT, DISAP, SUNK

b. Dependent Variable: IMAGE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.899	.687		2.765	.007
	RISK	.972	.100	.419	9.769	.000
	RESP	1.081	.073	.618	14.883	.000
	DISAP	.903	.091	.438	9.901	.000
	IMPORT	2.061E-03	.091	.001	.023	.982
	LIKELY	-4.89E-02	.095	-.021	-.514	.608
	MINI	-6.46E-02	.076	-.036	-.850	.398
	SUNK	8.032E-02	.075	.048	1.070	.288
	CONTROL	4.395E-02	.061	.029	.724	.471

a. Dependent Variable: IMAGE

Table 6.19a
Regression Analysis for Perceived Image Compatibility

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.741[a]	.550	.496	18922.99

a. Predictors: (Constant), IMAGE, LIKELY, CONTROL, MINI, IMPORT, SUNK, RISK, DISAP, RESP

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.32E+10	9	3692753995	10.313	.000[a]
	Residual	2.72E+10	76	358079621.8		
	Total	6.04E+10	85			

a. Predictors: (Constant), IMAGE, LIKELY, CONTROL, MINI, IMPORT, SUNK, RISK, DISAP, RESP

b. Dependent Variable: AMT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4796.338	17251.381		.278	.782
	RISK	-16666.2	3569.188	-.618	-4.669	.000
	RESP	-2593.472	3426.687	-.128	-.757	.451
	DISAP	-10969.2	3293.231	-.459	-3.331	.001
	IMPORT	2622.616	2192.109	.109	1.196	.235
	LIKELY	7834.399	2282.324	.284	3.433	.001
	MINI	5039.293	1828.281	.241	2.756	.007
	SUNK	4136.477	1812.771	.213	2.282	.025
	CONTROL	-2361.341	1459.707	-.136	-1.618	.110
	IMAGE	7700.677	2730.673	.663	2.820	.006

a. Dependent Variable: AMT

Table 6.20a
Regression Analysis for Perceived Image Compatibility and Problem Space

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.770[a]	.594	.492	19007.29

a. Predictors: (Constant), CI, MINI, LIKELY, RISK, IMPORT, RESP, SUNK, DISAP, IMAGE, CONTROL, MI, DI, LI, RE, II, SI, RI

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.59E+10	17	2110706028	5.842	.000[a]
	Residual	2.46E+10	68	361276981.5		
	Total	6.04E+10	85			

a. Predictors: (Constant), CI, MINI, LIKELY, RISK, IMPORT, RESP, SUNK, DISAP, IMAGE, CONTROL, MI, DI, LI, RE, II, SI, RI

b. Dependent Variable: AMT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	50500.800	95888.520		.527	.600
	RISK	-9848.891	17112.434	-.365	-.576	.567
	RESP	1032.616	11948.747	.051	.086	.931
	DISAP	3347.431	13192.680	.140	.254	.800
	IMPORT	-20777.7	14136.127	-.865	-1.470	.146
	LIKELY	-6371.930	15980.782	-.231	-.399	.691
	MINI	8751.520	10554.410	.419	.829	.410
	SUNK	-1464.679	13210.855	-.075	-.111	.912
	CONTROL	154.964	7708.748	.009	.020	.984
	IMAGE	4701.185	7985.070	.405	.589	.558
	RI	-598.816	1410.362	-.403	-.425	.672
	RE	-332.804	941.690	-.258	-.353	.725
	DI	-1303.221	1135.544	-.960	-1.148	.255
	II	1956.842	1175.478	1.310	1.665	.101
	LI	1141.508	1316.348	.621	.867	.389
	MI	-328.298	889.752	-.187	-.369	.713
	SI	457.751	1058.279	.362	.433	.667
	CI	-190.240	667.141	-.153	-.285	.776

a. Dependent Variable: AMT

Table 6.21a
Regression of Low Image Compatibility for Problem Space and Decision Outcomes

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.673[a]	.452	.337	19204.04

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, RESP, MINI, RISK, SUNK, IMPORT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.16E+10	8	1447691838	3.925	.002[a]
	Residual	1.40E+10	38	368794999.5		
	Total	2.56E+10	46			

a. Predictors: (Constant), CONTROL, DISAP, LIKELY, RESP, MINI, RISK, SUNK, IMPORT

b. Dependent Variable: AMT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9515.118	22288.518		.427	.672
	RISK	-7488.324	3221.252	-.324	-2.325	.026
	RESP	1993.633	2365.539	.110	.843	.405
	DISAP	-3241.089	3127.163	-.154	-1.036	.307
	IMPORT	4649.492	3512.734	.208	1.324	.194
	LIKELY	8621.986	3254.734	.364	2.649	.012
	MINI	5563.956	2644.687	.303	2.104	.042
	SUNK	3214.445	2634.434	.187	1.220	.230
	CONTROL	-2793.443	2051.408	-.197	-1.362	.181

a. Dependent Variable: AMT

Table 6.22a
Regression of High Image Compatibility for Problem Space and Decision Outcomes

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.648[a]	.420	.265	17372.52

a. Predictors: (Constant), CONTROL, SUNK, RISK, RESP, LIKELY, MINI, DISAP, IMPORT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.55E+09	8	819194705.7	2.714	.022[a]
	Residual	9.05E+09	30	301804488.7		
	Total	1.56E+10	38			

a. Predictors: (Constant), CONTROL, SUNK, RISK, RESP, LIKELY, MINI, DISAP, IMPORT

b. Dependent Variable: AMT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40199.673	26165.339		1.536	.135
	RISK	-1709.436	4231.909	-.070	-.404	.689
	RESP	7274.639	3057.061	.435	2.380	.024
	DISAP	-4326.220	3247.311	-.232	-1.332	.193
	IMPORT	1069.004	3012.908	.062	.355	.725
	LIKELY	2848.431	3833.252	.130	.743	.463
	MINI	216.566	2722.119	.014	.080	.937
	SUNK	2960.042	2778.852	.200	1.065	.295
	CONTROL	-1835.751	2495.418	-.126	-.736	.468

a. Dependent Variable: AMT

Table 6.23a
Component 1 ~ Sunk Cost

	+/-
Sunk Cost Too much invested	+.854
Minimise Loss	+.644
Intention Likely to invest	+.584

Component 2 ~ Accountability (Management Issues)

	+/-
Importance of the decision	+.801
Control	+.661
Responsibility for initial investment	+.651

Component 3 ~ Risk Utility (feelings about risk)

	+/-
Risk Perceived	+.830
Disappointment	+.798

Table 6.23b
Version 1: Negative Frame ($400,000 sunk cost) ~ means, standard deviations and correlations (N=31)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	39.35	22.53	-								
2	Intentions	3.58	.99	.479#	-							
3	Risk	3.55	.99	-.303	-.063	-						
4	Disappointment	3.32	1.01	1.261	.006	.315	-					
5	Importance	3.58	1.12	.075	.107	-.056	.241	-				
6	Responsibility	2.81	1.17	.097	.072	-.020	.252	.523#	-			
7	Minimise loss	2.87	1.34	.235	-.143	-.070	-.141	-.082	-.209	-		
8	Sunk costs	3.35	1.31	.053	.479#	.051	-.064	-.146	-.172	-.528#	-	
9	Control	4.10	1.70	-.024	-.074	-.230	-.057	.408*	.144	-.082	-.241	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Table 6.23c
Version 2: Positive Frame ($400,000 sunk cost) ~ means, standard deviations and correlations (N=33)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	53.48	25.60	-								
2	Intentions	3.79	.99	.098	-							
3	Risk	3.76	1.00	-.576#	.198	-						
4	Disappointment	3.45	1.09	-.109	-.005	.418*	-					
5	Importance	3.76	1.09	.014	.038	.345*	.672#	-				
6	Responsibility	3.15	1.44	.558#	-.042	-.277	.014	.124	-			
7	Minimise loss	2.39	1.34	.263	-.076	-.391*	-.338	-.338	.194	-		
8	Sunk costs	4.67	1.38	.294	.083	.098	.186	.110	.340	-.280	-	
9	Control	4.42	1.56	-.058	.261	.128	.177	.337	.096	.275	-.323	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Table 6.23d
Version 3: Negative Frame + Sunk cost $100,000 ~ means, standard deviations and correlations (N=22)

	Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Funding	60.22	29.29	-								
2	Intentions	3.55	.91	.410	-							
3	Risk	3.27	.94	-.395	-.138	-						
4	Disappointment	3.00	1.27	-.558#	-.059	.588#	-					
5	Importance	3.68	1.17	.022	.077	-.176	-.171	-				
6	Responsibility	3.36	1.29	.262	-.092	-.054	-.113	.385	-			
7	Minimise loss	2.55	1.06	.031	-.186	.043	-.056	.186	.060	-		
8	Sunk costs	3.73	.94	.341	.485*	-.053	.150	-.208	.141	-.286	-	
9	Control	4.27	1.28	-.365	.191	-.099	.296	.136	-.017	.193	.044	-

Significant at 0.05 level (2-tailed)
* Significant at 0.01 level (2-tailed)

Appendix F

Supporting Statistics for Chapter 7

Table 7.3a
Analysis of Early Late Responses ~ Outsourcing Decision

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
EL * OUTSRC	237	100.0%	0	.0%	237	100.0%

EL * OUTSRC Crosstabulation

Count

		OUTSRC		Total
		1	2	
EL	1	64	109	173
	2	22	42	64
Total		86	151	237

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.139[b]	1	.710		
Continuity Correction[a]	.048	1	.826		
Likelihood Ratio	.139	1	.709		
Fisher's Exact Test				.762	.415
Linear-by-Linear Association	.138	1	.710		
N of Valid Cases	237				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.22.

Table 7.4a
Analysis of Early Late Responses ~ Investment Decision

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RISK	Equal variances assumed	.310	.578	.400	235	.690	5.73E-02	.14	-.22	.34
	Equal variances not assumed			.409	117.946	.683	5.73E-02	.14	-.22	.33
DISAP	Equal variances assumed	1.049	.307	1.552	235	.122	.16	.11	-4.41E-02	.37
	Equal variances not assumed			1.550	112.287	.124	.16	.11	-4.56E-02	.37
IMPORTAN	Equal variances assumed	.263	.608	3.330	235	.001	.34	.10	.14	.54
	Equal variances not assumed			3.057	96.861	.003	.34	.11	.12	.56
RESPON	Equal variances assumed	.614	.434	.459	235	.647	6.48E-02	.14	-.21	.34
	Equal variances not assumed			.471	118.486	.639	6.48E-02	.14	-.21	.34
MINI	Equal variances assumed	.272	.602	.667	235	.505	.15	.23	-.30	.60
	Equal variances not assumed			.670	113.538	.504	.15	.23	-.30	.60
SOMUCH	Equal variances assumed	.699	.404	1.766	235	.079	.39	.22	-4.50E-02	.82
	Equal variances not assumed			1.781	114.465	.078	.39	.22	-4.36E-02	.82
SUCCESS	Equal variances assumed	.035	.852	-.273	235	.785	-6.14E-02	.23	-.51	.38
	Equal variances not assumed			-.280	118.749	.780	-6.14E-02	.22	-.50	.37
LIKELY	Equal variances assumed	.203	.653	-.537	235	.592	-.12	.23	-.58	.33
	Equal variances not assumed			-.522	106.755	.603	-.12	.24	-.59	.35
AMOUNT	Equal variances assumed	.422	.516	-.349	235	.727	-1825.78	5228.67	12126.84	8475.28
	Equal variances not assumed			-.356	116.672	.723	-1825.78	5134.63	11994.94	8343.38

Table 7.7a
Crosstabulation of Outsourcing Decision * Sunk Cost High/Low

	Outsource		
	No	Yes	Total
Rational	45	85	130
Intuitive	8	16	24
Total	53	101	154

Result: χ^2 sample = 0.015 (α =0.903, df = 1)

Decision: **Cannot reject the null hypothesis.**

Computed χ^2 does not exceed the critical value: χ^2 critical = 3.841 (α =0.05, df = 1)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.015[b]	1	.903		
Continuity Correction [a]	.000	1	1.000		
Likelihood Ratio	.015	1	.903		
Fisher's Exact Test				1.000	.551
Linear-by-Linear Association	.015	1	.904		
N of Valid Cases	154				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.26.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.010	.903
	Cramer's V	.010	.903
	Contingency Coefficient	.010	.903
N of Valid Cases		154	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 7.7b
Crosstabulation of Rational vs Intuitive ~ Version "A"

RAIN * OUTSRC * A Crosstabulation

Count

A			OUTSRC 1	OUTSRC 2	Total
1	RAIN	1	35	14	49
		2	1	6	7
	Total		36	20	56

Chi-Square Tests

A		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
1	Pearson Chi-Square	8.711[b]	1	.003		
	Continuity Correction[a]	6.400	1	.011		
	Likelihood Ratio	8.625	1	.003		
	Fisher's Exact Test				.006	.006
	Linear-by-Linear Association	8.556	1	.003		
	N of Valid Cases	56				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.50.

Symmetric Measures

A			Value	Approx. Sig.
1	Nominal by Nominal	Phi	.394	.003
		Cramer's V	.394	.003
		Contingency Coefficient	.367	.003
	N of Valid Cases		56	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

There was a **significant difference** in the decision to outsource between rational and intuitive decision makers in version "A" of the survey.

Table 7.7c
Crosstabulation of Rational vs Intuitive ~ Version "B"

RAIN * OUTSRC * B Crosstabulation

Count

B			OUTSRC 1	OUTSRC 2	Total
2	RAIN	1	4	40	44
		2	2	5	7
	Total		6	45	51

Chi-Square Tests

B		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
2	Pearson Chi-Square	2.208[b]	1	.137		
	Continuity Correction[a]	.730	1	.393		
	Likelihood Ratio	1.762	1	.184		
	Fisher's Exact Test				.186	.186
	Linear-by-Linear Association	2.165	1	.141		
	N of Valid Cases	51				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is .82.

Symmetric Measures

B			Value	Approx. Sig.
2	Nominal by Nominal	Phi	-.208	.137
		Cramer's V	.208	.137
		Contingency Coefficient	.204	.137
	N of Valid Cases		51	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

There was no significant difference in the decision to outsource between rational and intuitive decision makers in version "B" of the survey.

Table 7.7d
Crosstabulation of Rational vs Intuitive ~ Version "C"

RAIN * OUTSRC * C Crosstabulation

Count

C			OUTSRC		Total
			1	2	
3	RAIN	1	1	19	20
		2	2	3	5
	Total		3	22	25

Chi-Square Tests

C		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
3	Pearson Chi-Square	4.640[b]	1	.031		
	Continuity Correction[a]	1.918	1	.166		
	Likelihood Ratio	3.676	1	.055		
	Fisher's Exact Test				.091	.091
	Linear-by-Linear Association	4.455	1	.035		
	N of Valid Cases	25				

a. Computed only for a 2x2 table

b. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .60.

Symmetric Measures

C			Value	Approx. Sig.
3	Nominal by Nominal	Phi	-.431	.031
		Cramer's V	.431	.031
		Contingency Coefficient	.396	.031
	N of Valid Cases		25	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

There was a **significant difference** in the decision to outsource between rational and intuitive decision makers in version "C" of the survey.

Table 7.7e
Crosstabulation of Rational vs Intuitive ~ Version "D"

RAIN * OUTSRC * D Crosstabulation

Count

D			OUTSRC 1	OUTSRC 2	Total
4	RAIN	1	5	12	17
		2	3	2	5
	Total		8	14	22

Chi-Square Tests

D		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
4	Pearson Chi-Square	1.562[b]	1	.211		
	Continuity Correction[a]	.520	1	.471		
	Likelihood Ratio	1.514	1	.219		
	Fisher's Exact Test				.309	.233
	Linear-by-Linear Association	1.491	1	.222		
	N of Valid Cases	22				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.82.

Symmetric Measures

D			Value	Approx. Sig.
4	Nominal by Nominal	Phi	-.266	.211
		Cramer's V	.266	.211
		Contingency Coefficient	.257	.211
	N of Valid Cases		22	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

There was a **significant difference** in the decision to outsource between rational and intuitive decision makers in version "D" of the survey.

Table 7.9a
Crosstabulation of Decision to Outsource

AB * OUTSRC Crosstabulation

Count

		OUTSRC		
		1	2	Total
AB	1	50	33	83
	2	15	71	86
Total		65	104	169

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	32.688[b]	1	.000		
Continuity Correction[a]	30.905	1	.000		
Likelihood Ratio	34.041	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	32.494	1	.000		
N of Valid Cases	169				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 31.92.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.440	.000
	Cramer's V	.440	.000
	Contingency Coefficient	.403	.000
N of Valid Cases		169	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Result:

For the sample "A vs B", the obtained $\chi^2 = 32.688$, df = 1, was significant at $\alpha = 0.000$.

Decision:

Therefore, the **null hypothesis was rejected.**

Table 7.10a
Crosstabulations of Outsourcing "A" and "C"

AC * OUTSRC Crosstabulation

Count

		OUTSRC		Total
		1	2	
AC	1	50	33	83
	3	7	28	35
Total		57	61	118

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.965[b]	1	.000		
Continuity Correction[a]	14.394	1	.000		
Likelihood Ratio	16.863	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	15.829	1	.000		
N of Valid Cases	118				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.91.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.368	.000
	Cramer's V	.368	.000
	Contingency Coefficient	.345	.000
N of Valid Cases		118	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Result:

For the sample "A vs C" the obtained $\chi^2 = 15.965$, df = 1, was significant at α =0.000.

Therefore, the **null hypothesis was rejected.**

Table 7.11a
Crosstabulations of Outsourcing "B" and "C"

BC * OUTSRC Crosstabulation

Count

		OUTSRC		Total
		1	2	
BC	2	15	71	86
	3	7	28	35
Total		22	99	121

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.109[b]	1	.741		
Continuity Correction[a]	.005	1	.943		
Likelihood Ratio	.108	1	.743		
Fisher's Exact Test				.797	.462
Linear-by-Linear Association	.109	1	.742		
N of Valid Cases	121				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.36.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.030	.741
	Cramer's V	.030	.741
	Contingency Coefficient	.030	.741
N of Valid Cases		121	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Result:

For the sample "B vs C" the obtained $\chi^2 = 0.109$, df = 1, was not significant at $\alpha = 0.741$. Therefore, the null hypothesis cannot be rejected.

Table 7.12a
Crosstabulations of Outsourcing "A" and "B" vs "C"

ABVC * OUTSRC Crosstabulation

Count

		OUTSRC		
		1	2	Total
ABVC	1	65	104	169
	2	7	28	35
Total		72	132	204

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.327[b]	1	.038		
Continuity Correction[a]	3.557	1	.059		
Likelihood Ratio	4.663	1	.031		
Fisher's Exact Test				.051	.027
Linear-by-Linear Association	4.306	1	.038		
N of Valid Cases	204				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.35.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.146	.038
	Cramer's V	.146	.038
	Contingency Coefficient	.144	.038
N of Valid Cases		204	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Result:

For the sample "AB vs C" the obtained $\chi^2 = 4.327$, df = 1, was significant at $\alpha = 0.038$.

Therefore, the **null hypothesis was rejected.**

Table 7.13a
Crosstabulations of Outsourcing "C" and "D"

CVD * OUTSRC Crosstabulation

Count

		OUTSRC		Total
		1	2	
CVD	3	7	28	35
	4	14	19	33
Total		21	47	68

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.001[b]	1	.045		
Continuity Correction[a]	3.020	1	.082		
Likelihood Ratio	4.054	1	.044		
Fisher's Exact Test				.066	.041
Linear-by-Linear Association	3.943	1	.047		
N of Valid Cases	68				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.19.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.243	.045
	Cramer's V	.243	.045
	Contingency Coefficient	.236	.045
N of Valid Cases		68	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Result:

For the sample "C vs D" the obtained $\chi^2 = 4.001$, df = 1, was significant at $\alpha = 0.045$.

Therefore, the **null hypothesis was rejected.**

Table 7.15a
Multiple Comparisons for Framing of All Groups

Multiple Comparisons

Dependent Variable: AMOUNT

	(I) PAPER	(J) PAPER	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1	2	-6207.11	7208.68	.980	-30402.53	17988.31
		3	31346.25*	6704.92	.001	8841.66	53850.83
		4	32869.28*	6537.64	.000	10926.16	54812.40
		5	837.54	7016.28	1.000	-22712.11	24387.18
		6	-3110.52	7141.25	.999	-27079.62	20858.58
	2	1	6207.11	7208.68	.980	-17988.31	30402.53
		3	37553.35*	7539.99	.000	12245.89	62860.82
		4	39076.39*	7391.64	.000	14266.87	63885.90
		5	7044.64	7818.17	.976	-19196.49	33285.77
		6	3096.59	7930.51	1.000	-23521.62	29714.80
	3	1	-31346.25*	6704.92	.001	-53850.83	-8841.66
		2	-37553.35*	7539.99	.000	-62860.82	-12245.89
		4	1523.04	6901.25	1.000	-21640.52	24686.59
		5	-30508.71*	7356.27	.005	-55199.50	-5817.92
		6	-34456.76*	7475.56	.001	-59547.94	-9365.58
	4	1	-32869.28*	6537.64	.000	-54812.40	-10926.16
		2	-39076.39*	7391.64	.000	-63885.90	-14266.87
		3	-1523.04	6901.25	1.000	-24686.59	21640.52
		5	-32031.75*	7204.13	.002	-56211.89	-7851.60
		6	-35979.80*	7325.89	.000	-60568.65	-11390.95
	5	1	-837.54	7016.28	1.000	-24387.18	22712.11
		2	-7044.64	7818.17	.976	-33285.77	19196.49
		3	30508.71*	7356.27	.005	5817.92	55199.50
		4	32031.75*	7204.13	.002	7851.60	56211.89
		6	-3948.05	7756.04	.998	-29980.66	22084.55
	6	1	3110.52	7141.25	.999	-20858.58	27079.62
		2	-3096.59	7930.51	1.000	-29714.80	23521.62
		3	34456.76*	7475.56	.001	9365.58	59547.94
		4	35979.80*	7325.89	.000	11390.95	60568.65
		5	3948.05	7756.04	.998	-22084.55	29980.66
LSD	1	2	-6207.11	7208.68	.390	-20410.27	7996.05
		3	31346.25*	6704.92	.000	18135.64	44556.86
		4	32869.28*	6537.64	.000	19988.26	45750.30
		5	837.54	7016.28	.905	-12986.54	14661.61
		6	-3110.52	7141.25	.664	-17180.82	10959.79
	2	1	6207.11	7208.68	.390	-7996.05	20410.27
		3	37553.35*	7539.99	.000	22697.40	52409.30
		4	39076.39*	7391.64	.000	24512.74	53640.03
		5	7044.64	7818.17	.368	-8359.39	22448.67
		6	3096.59	7930.51	.697	-12528.79	18721.97
	3	1	-31346.25*	6704.92	.000	-44556.86	-18135.64
		2	-37553.35*	7539.99	.000	-52409.30	-22697.40
		4	1523.04	6901.25	.826	-12074.40	15120.47
		5	-30508.71*	7356.27	.000	-45002.66	-16014.76
		6	-34456.76*	7475.56	.000	-49185.75	-19727.77
	4	1	-32869.28*	6537.64	.000	-45750.30	-19988.26
		2	-39076.39*	7391.64	.000	-53640.03	-24512.74
		3	-1523.04	6901.25	.826	-15120.47	12074.40
		5	-32031.75*	7204.13	.000	-46225.94	-17837.55
		6	-35979.80*	7325.89	.000	-50413.91	-21545.69
	5	1	-837.54	7016.28	.905	-14661.61	12986.54
		2	-7044.64	7818.17	.368	-22448.67	8359.39
		3	30508.71*	7356.27	.000	16014.76	45002.66
		4	32031.75*	7204.13	.000	17837.55	46225.94
		6	-3948.05	7756.04	.611	-19229.67	11333.57
	6	1	3110.52	7141.25	.664	-10959.79	17180.82
		2	-3096.59	7930.51	.697	-18721.97	12528.79
		3	34456.76*	7475.56	.000	19727.77	49185.75
		4	35979.80*	7325.89	.000	21545.69	50413.91
		5	3948.05	7756.04	.611	-11333.57	19229.67
Dunnett t (2-sided) [a]	1	6	-3110.52	7141.25	.989	-21070.47	14849.44
	2	6	3096.59	7930.51	.993	-16848.34	23041.52
	3	6	-34456.76*	7475.56	.000	-53257.49	-15656.03
	4	6	-35979.80*	7325.89	.000	-54404.13	-17555.46
	5	6	-3948.05	7756.04	.979	-23454.19	15558.08

*. The mean difference is significant at the .05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

Table 7.16a
ANOVA for Framing of X1 to Y1

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.23E+10	1	2.233E+10	17.847	.000
Within Groups	1.13E+11	90	1251338807		
Total	1.35E+11	91			

Result:

The difference between groups is significant (F = 17.847, p =0.000, df = 1).

Decision:

Therefore, **reject the null hypothesis.**

Descriptives

AMOUNT1

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	51	65980.39	34293.14	4802.00	56335.29	75625.49	0	100000
3	41	34634.15	36680.89	5728.59	23056.23	46212.06	0	100000
Total	92	52010.87	38509.74	4014.92	44035.73	59986.01	0	100000

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMOUNT1	Equal variances assumed	.568	.453	4.225	90	.000	31346.25	7420.01	16605.11	46087.39
	Equal variances not assumed			4.193	83.128	.000	31346.25	7475.02	16479.06	46213.43

Table 7.17a
ANOVA for Framing of X2 to Y2

ANOVA

AMOUNT2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.86E+10	1	2.856E+10	32.717	.000
Within Groups	6.55E+10	75	872817592.6		
Total	9.40E+10	76			

Result:

The difference between groups is significant (F = 32.717, p =0.000, df = 1).

Decision:

Therefore, reject the null hypothesis.

Descriptives

AMOUNT2

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
2	32	72187.50	23757.43	4199.76	63622.03	80752.97	30000	100000
4	45	33111.11	33016.68	4921.84	23191.80	43030.42	0	100000
Total	77	49350.65	35172.05	4008.23	41367.57	57333.72	0	100000

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMOUNT2	Equal variances assumed	4.694	.033	5.720	75	.000	39076.39	6831.65	25467.04	52685.74
	Equal variances not assumed			6.040	74.980	.000	39076.39	6470.12	26187.19	51965.58

Table 7.19a
ANOVA for Sunk Costs of X2 to Z1

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.30E+08	1	829585554.4	1.210	.275
Within Groups	4.46E+10	65	685710164.8		
Total	4.54E+10	66			

Result:

(ANOVA) X2 vs Z1 F= 1.210 ($p<0.275$, df = 1)

Decision:

Therefore the null hypothesis cannot be rejected.

Group Statistics

	PAP1	N	Mean	Std. Deviation	Std. Error Mean
AMOUNT1	2	32	72187.50	23757.43	4199.76
	5	35	65142.86	28218.83	4769.85

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMOUNT1	Equal variances assumed	2.611	.111	1.100	65	.275	7044.64	6404.70	-5746.42	19835.71
	Equal variances not assumed			1.108	64.581	.272	7044.64	6355.27	-5649.27	19738.56

Table 7.20a
ANOVA for Sunk Costs of Y2 to Z2

ANOVA

AMOUNT2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.46E+10	1	2.465E+10	23.759	.000
Within Groups	7.88E+10	76	1037331207		
Total	1.03E+11	77			

Result:

(ANOVA) Y2 vs Z2 F= 23.759 ($p<0.000$, df = 1)

Decision:

Therefore the null hypothesis is rejected.

Group Statistics

	PAP2	N	Mean	Std. Deviation	Std. Error Mean
AMOUNT2	4	45	33111.11	33016.68	4921.84
	6	33	69090.91	31060.79	5406.99

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMOUNT2	Equal variances assumed	.003	.954	-4.874	76	.000	-35979.80	7381.47	-50681.27	-21278.33
	Equal variances not assumed			-4.921	71.366	.000	-35979.80	7311.63	-50557.49	-21402.11

Table 7.22a
ANOVA for Perceived Level of Responsibility/Funding

ANOVA

AMOUNT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.43E+10	5	1.285E+10	12.580	.000
Within Groups	2.36E+11	231	1021769805		
Total	3.00E+11	236			

Result:

The result was F = 12.580, (α =0.000, df = 5)

Decision:

Reject the null hypothesis.

AMOUNT

	PAPER	N	Subset for alpha = .05 1	2
Scheffe[a,b]	4	45	33111.11	
	3	41	34634.15	
	5	35		65142.86
	1	51		65980.39
	6	33		69090.91
	2	32		72187.50
	Sig.		1.000	.968

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 38.377.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 7.22b
Multiple Comparisons for Perceived Level of Responsibility/Funding

Multiple Comparisons

Dependent Variable: AMOUNT

	(I) PAPER	(J) PAPER	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1	2	-6207.11	7208.68	.980	-30402.53	17988.31
		3	31346.25*	6704.92	.001	8841.66	53850.83
		4	32869.28*	6537.64	.000	10926.16	54812.40
		5	837.54	7016.28	1.000	-22712.11	24387.18
		6	-3110.52	7141.25	.999	-27079.62	20858.58
	2	1	6207.11	7208.68	.980	-17988.31	30402.53
		3	37553.35*	7539.99	.000	12245.89	62860.82
		4	39076.39*	7391.64	.000	14266.87	63885.90
		5	7044.64	7818.17	.976	-19196.49	33285.77
		6	3096.59	7930.51	1.000	-23521.62	29714.80
	3	1	-31346.25*	6704.92	.001	-53850.83	-8841.66
		2	-37553.35*	7539.99	.000	-62860.82	-12245.89
		4	1523.04	6901.25	1.000	-21640.52	24686.59
		5	-30508.71*	7356.27	.005	-55199.50	-5817.92
		6	-34456.76*	7475.56	.001	-59547.94	-9365.58
	4	1	-32869.28*	6537.64	.000	-54812.40	-10926.16
		2	-39076.39*	7391.64	.000	-63885.90	-14266.87
		3	-1523.04	6901.25	1.000	-24686.59	21640.52
		5	-32031.75*	7204.13	.002	-56211.89	-7851.60
		6	-35979.80*	7325.89	.000	-60568.65	-11390.95
	5	1	-837.54	7016.28	1.000	-24387.18	22712.11
		2	-7044.64	7818.17	.976	-33285.77	19196.49
		3	30508.71*	7356.27	.005	5817.92	55199.50
		4	32031.75*	7204.13	.002	7851.60	56211.89
		6	-3948.05	7756.04	.998	-29980.66	22084.55
	6	1	3110.52	7141.25	.999	-20858.58	27079.62
		2	-3096.59	7930.51	1.000	-29714.80	23521.62
		3	34456.76*	7475.56	.001	9365.58	59547.94
		4	35979.80*	7325.89	.000	11390.95	60568.65
		5	3948.05	7756.04	.998	-22084.55	29980.66
LSD	1	2	-6207.11	7208.68	.390	-20410.27	7996.05
		3	31346.25*	6704.92	.000	18135.64	44556.86
		4	32869.28*	6537.64	.000	19988.26	45750.30
		5	837.54	7016.28	.905	-12986.54	14661.61
		6	-3110.52	7141.25	.664	-17180.82	10959.79
	2	1	6207.11	7208.68	.390	-7996.05	20410.27
		3	37553.35*	7539.99	.000	22697.40	52409.30
		4	39076.39*	7391.64	.000	24512.74	53640.03
		5	7044.64	7818.17	.368	-8359.39	22448.67
		6	3096.59	7930.51	.697	-12528.79	18721.97
	3	1	-31346.25*	6704.92	.000	-44556.86	-18135.64
		2	-37553.35*	7539.99	.000	-52409.30	-22697.40
		4	1523.04	6901.25	.826	-12074.40	15120.47
		5	-30508.71*	7356.27	.000	-45002.66	-16014.76
		6	-34456.76*	7475.56	.000	-49185.75	-19727.77
	4	1	-32869.28*	6537.64	.000	-45750.30	-19988.26
		2	-39076.39*	7391.64	.000	-53640.03	-24512.74
		3	-1523.04	6901.25	.826	-15120.47	12074.40
		5	-32031.75*	7204.13	.000	-46225.94	-17837.55
		6	-35979.80*	7325.89	.000	-50413.91	-21545.69
	5	1	-837.54	7016.28	.905	-14661.61	12986.54
		2	-7044.64	7818.17	.368	-22448.67	8359.39
		3	30508.71*	7356.27	.000	16014.76	45002.66
		4	32031.75*	7204.13	.000	17837.55	46225.94
		6	-3948.05	7756.04	.611	-19229.67	11333.57
	6	1	3110.52	7141.25	.664	-10959.79	17180.82
		2	-3096.59	7930.51	.697	-18721.97	12528.79
		3	34456.76*	7475.56	.000	19727.77	49185.75
		4	35979.80*	7325.89	.000	21545.69	50413.91
		5	3948.05	7756.04	.611	-11333.57	19229.67
Dunnett t (2-sided) [a]	1	6	-3110.52	7141.25	.989	-21070.47	14849.44
	2	6	3096.59	7930.51	.993	-16848.34	23041.52
	3	6	-34456.76*	7475.56	.000	-53257.49	-15656.03
	4	6	-35979.80*	7325.89	.000	-54404.13	-17555.46
	5	6	-3948.05	7756.04	.979	-23454.19	15558.08

*. The mean difference is significant at the .05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

Table 7.23a
ANOVA for Perceived Responsibility on Intention to Fund

ANOVA

LIKELY

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	76.838	5	15.368	6.984	.000
Within Groups	508.326	231	2.201		
Total	585.165	236			

Result:

The result was F = 6.984 (α =0.000, df = 6)

Decision:

Reject the null hypothesis.

LIKELY

	PAPER	N	Subset for alpha = .05		
			1	2	3
Scheffe[a,b]	3	41	2.78		
	4	45	2.89	2.89	
	1	51	3.51	3.51	3.51
	2	32		4.00	4.00
	6	33			4.03
	5	35			4.29
	Sig.		.464	.060	.389

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 38.377.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 23b
Multiple Comparisons for Perceived Responsibility on Intention to Fund

Multiple Comparisons

Dependent Variable: LIKELY

	(I) PAPER	(J) PAPER	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1	2	-.49	.33	.828	-1.61	.63
		3	.73	.31	.362	-.32	1.77
		4	.62	.30	.524	-.40	1.64
		5	-.78	.33	.342	-1.87	.32
		6	-.52	.33	.781	-1.63	.59
	2	1	.49	.33	.828	-.63	1.61
		3	1.22*	.35	.036	4.51E-02	2.39
		4	1.11	.34	.066	-4.02E-02	2.26
		5	-.29	.36	.987	-1.50	.93
		6	-3.03E-02	.37	1.000	-1.27	1.20
	3	1	-.73	.31	.362	-1.77	.32
		2	-1.22*	.35	.036	-2.39	-4.51E-02
		4	-.11	.32	1.000	-1.18	.97
		5	-1.51*	.34	.002	-2.65	-.36
		6	-1.25*	.35	.026	-2.41	-8.54E-02
	4	1	-.62	.30	.524	-1.64	.40
		2	-1.11	.34	.066	-2.26	4.02E-02
		3	.11	.32	1.000	-.97	1.18
		5	-1.40*	.33	.005	-2.52	-.27
		6	-1.14*	.34	.050	-2.28	-3.05E-04
	5	1	.78	.33	.342	-.32	1.87
		2	.29	.36	.987	-.93	1.50
		3	1.51*	.34	.002	.36	2.65
		4	1.40*	.33	.005	.27	2.52
		6	.26	.36	.992	-.95	1.46
	6	1	.52	.33	.781	-.59	1.63
		2	3.03E-02	.37	1.000	-1.20	1.27
		3	1.25*	.35	.026	8.54E-02	2.41
		4	1.14*	.34	.050	3.05E-04	2.28
		5	-.26	.36	.992	-1.46	.95
LSD	1	2	-.49	.33	.144	-1.15	.17
		3	.73*	.31	.020	.12	1.34
		4	.62*	.30	.042	2.31E-02	1.22
		5	-.78*	.33	.018	-1.42	-.13
		6	-.52	.33	.118	-1.17	.13
	2	1	.49	.33	.144	-.17	1.15
		3	1.22*	.35	.001	.53	1.91
		4	1.11*	.34	.001	.44	1.79
		5	-.29	.36	.432	-1.00	.43
		6	-3.03E-02	.37	.934	-.76	.69
	3	1	-.73*	.31	.020	-1.34	-.12
		2	-1.22*	.35	.001	-1.91	-.53
		4	-.11	.32	.735	-.74	.52
		5	-1.51*	.34	.000	-2.18	-.83
		6	-1.25*	.35	.000	-1.93	-.57
	4	1	-.62*	.30	.042	-1.22	-2.31E-02
		2	-1.11*	.34	.001	-1.79	-.44
		3	.11	.32	.735	-.52	.74
		5	-1.40*	.33	.000	-2.06	-.74
		6	-1.14*	.34	.001	-1.81	-.47
	5	1	.78*	.33	.018	.13	1.42
		2	.29	.36	.432	-.43	1.00
		3	1.51*	.34	.000	.83	2.18
		4	1.40*	.33	.000	.74	2.06
		6	.26	.36	.479	-.45	.96
	6	1	.52	.33	.118	-.13	1.17
		2	3.03E-02	.37	.934	-.69	.76
		3	1.25*	.35	.000	.57	1.93
		4	1.14*	.34	.001	.47	1.81
		5	-.26	.36	.479	-.96	.45
Dunnett t (2-sided) [a]	1	6	-.52	.33	.363	-1.35	.31
	2	6	-3.03E-02	.37	1.000	-.96	.90
	3	6	-1.25*	.35	.002	-2.12	-.38
	4	6	-1.14*	.34	.004	-2.00	-.29
	5	6	.26	.36	.921	-.65	1.16

*. The mean difference is significant at the .05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

Table 7.24a
ANOVA of Manipulation of Wording X1 to X2

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.58E+08	1	757566294.6	.804	.372
Within Groups	7.63E+10	81	941948832.0		
Total	7.71E+10	82			

Result:

The result was F = 0.804, p =0.372, df =1

Decision:

Cannot reject the null hypothesis.

Group Statistics

	PAP1	N	Mean	Std. Deviation	Std. Error Mean
AMOUNT1	1	51	65980.39	34293.14	4802.00
	2	32	72187.50	23757.43	4199.76

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMOUNT Equal variance assumed	3.710	.058	-.897	81	.372	-6207.11	6921.38	9978.48	7564.27
Equal variance not assumed			-.973	80.129	.333	-6207.11	6379.43	8902.27	6488.06

Table 7.25a
ANOVA of Manipulation of Wording Y1 to Y2

ANOVA

AMOUNT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	49764291	1	49764290.67	.041	.840
Within Groups	1.02E+11	84	1211713770		
Total	1.02E+11	85			

Warnings

Post hoc tests are not performed for AMOUNT1 because there are fewer than three groups.

Result:

The result was F = 0.041, p =0.840, df = 1

Decision:

Cannot reject the null hypothesis.

Group Statistics

	PAP1	N	Mean	Std. Deviation	Std. Error Mean
AMOUNT1	3	41	34634.15	36680.89	5728.59
	4	45	33111.11	33016.68	4921.84

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AMOUNT	Equal variance assumed	.580	.448	.203	84	.840	1523.04	7515.38	13422.13	16468.20
	Equal variance not assumed			.202	80.816	.841	1523.04	7552.57	13504.72	16550.79

Table 7.25b
Test for Significance X1 vs X2

Test Statistics[a]

	RISK1	DISAP1	IMPORT1	RESP1	MINI1	SUNK1	SUC1	LIKE1
Mann-Whitney U	675.500	733.500	715.500	788.500	775.000	803.000	737.500	640.000
Wilcoxon W	1203.500	1261.500	1243.500	2114.500	1303.000	1331.000	1265.500	1966.000
Z	-1.390	-.864	-1.055	-.271	-.402	-.126	-.751	-1.696
Asymp. Sig. (2-tailed	.164	.387	.291	.786	.688	.900	.453	.090

a. Grouping Variable: PAP1

Table 7.25c
Test for Significance X1 vs X2 ~ continued

Test Statistics[a]

		RISK1	DISAP1	IMPORT1	RESP1	MINI1	SUNK1	SUC1	LIKE1
Most Extreme Differences	Absolute	.184	.078	.173	.054	.118	.184	.112	.178
	Positive	.000	.020	.044	.054	.118	.184	.024	.178
	Negative	-.184	-.078	-.173	-.002	-.080	-.091	-.112	-.008
Kolmogorov-Smirnov Z		.818	.345	.769	.239	.522	.818	.495	.788
Asymp. Sig. (2-tailed)		.515	1.000	.595	1.000	.948	.515	.967	.564

a. Grouping Variable: PAP1

Table 7.25d
Test for Significance Y1 vs Y2

Test Statistics[a]

	RISK1	DISAP1	IMPORT1	RESP1	MINI1	SUNK1	SUC1	LIKE1
Mann-Whitney U	857.500	727.500	771.000	862.500	764.500	840.000	816.000	859.000
Wilcoxon W	1718.500	1762.500	1806.000	1723.500	1799.500	1875.000	1851.000	1720.000
Z	-.593	-1.831	-1.427	-.558	-1.398	-.730	-.939	-.562
Asymp. Sig. (2-tailed)	.553	.067	.154	.577	.162	.466	.348	.574

a. Grouping Variable: PAP1

Table 7.25e
Test for Significance Y1 vs Y2 ~ continued

Test Statistics[a]

		RISK1	DISAP1	IMPORT1	RESP1	MINI1	SUNK1	SUC1	LIKE1
Most Extreme Differences	Absolute	.118	.276	.149	.148	.136	.144	.113	.137
	Positive	.038	.276	.149	.086	.136	.144	.113	.108
	Negative	-.118	-.040	.000	-.148	-.011	-.046	.000	-.137
Kolmogorov-Smirnov Z		.547	1.280	.690	.685	.630	.665	.522	.635
Asymp. Sig. (2-tailed)		.926	.075	.727	.735	.822	.768	.948	.815

a. Grouping Variable: PAP1

Table 7.27a
MANOVA Testing of Framing Effect on Problem-space X1 to X2

Group Statistics

	PAP1	N	Mean	Std. Deviation	Std. Error Mean
RISK1	1	51	3.63	.94	.13
	3	41	3.66	1.02	.16
DISAP1	1	51	4.27	.67	9.32E-02
	3	41	4.41	.81	.13
IMPORT1	1	51	4.25	.69	9.64E-02
	3	41	4.37	.62	9.73E-02
RESP1	1	51	3.73	.90	.13
	3	41	3.63	1.07	.17
MINI1	1	51	4.92	1.51	.21
	3	41	3.73	1.38	.22
SUNK1	1	51	4.78	1.54	.22
	3	41	3.66	1.54	.24
SUC1	1	51	4.61	1.51	.21
	3	41	4.37	1.59	.25
LIKE1	1	51	3.51	1.43	.20
	3	41	2.78	1.67	.26

Table 7.27b
MANOVA Testing of Framing Effect on Problem-space X1 to X2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RISK1	Equal variances assumed	.001	.976	-.152	90	.879	-3.11E-02	.20	-.44	.37
	Equal variances not assumed			-.151	82.582	.880	-3.11E-02	.21	-.44	.38
DISAP1	Equal variances assumed	4.990	.028	-.914	90	.363	-.14	.15	-.44	.16
	Equal variances not assumed			-.895	77.335	.374	-.14	.16	-.45	.17
IMPORT	Equal variances assumed	.172	.680	-.802	90	.425	-.11	.14	-.39	.16
	Equal variances not assumed			-.810	88.703	.420	-.11	.14	-.38	.16
RESP1	Equal variances assumed	1.287	.260	.446	90	.656	9.13E-02	.20	-.32	.50
	Equal variances not assumed			.438	78.146	.663	9.13E-02	.21	-.32	.51
MINI1	Equal variances assumed	.077	.782	3.907	90	.000	1.19	.30	.58	1.79
	Equal variances not assumed			3.945	88.468	.000	1.19	.30	.59	1.79
SUNK1	Equal variances assumed	.295	.589	3.482	90	.001	1.13	.32	.48	1.77
	Equal variances not assumed			3.481	85.742	.001	1.13	.32	.48	1.77
SUC1	Equal variances assumed	.217	.643	.745	90	.458	.24	.32	-.40	.89
	Equal variances not assumed			.741	83.740	.461	.24	.33	-.41	.89
LIKE1	Equal variances assumed	.950	.332	2.256	90	.026	.73	.32	8.71E-02	1.37
	Equal variances not assumed			2.219	79.308	.029	.73	.33	7.53E-02	1.38

Table 7.28a
MANOVA Testing of Framing Effect on Problem-space X2 to Y2

Group Statistics

	PAP2	N	Mean	Std. Deviation	Std. Error Mean
RISK2	2	32	3.31	.78	.14
	4	45	3.80	1.01	.15
DISAP2	2	32	4.16	.68	.12
	4	45	4.16	.74	.11
IMPORT2	2	32	4.13	.55	9.79E-02
	4	45	4.09	.85	.13
RESP2	2	32	3.78	.94	.17
	4	45	3.78	.79	.12
MINI2	2	32	5.00	.98	.17
	4	45	3.33	1.54	.23
SUNK2	2	32	4.94	.91	.16
	4	45	3.40	1.27	.19
SUCC2	2	32	4.41	1.39	.25
	4	45	4.07	1.50	.22
LIKE2	2	32	4.00	1.30	.23
	4	45	2.89	1.53	.23

Table 7.28b
MANOVA Testing of Framing Effect on Problem-space X2 to Y2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RISK2	Equal variances assumed	2.224	.140	-2.281	75	.025	-.49	.21	-.91	-6.17E-02
	Equal variances not assumed			-2.383	74.477	.020	-.49	.20	-.90	-7.99E-02
DISAP2	Equal variances assumed	.119	.731	.004	75	.997	6.94E-04	.16	-.33	.33
	Equal variances not assumed			.004	70.156	.997	6.94E-04	.16	-.32	.32
IMPORT2	Equal variances assumed	5.611	.020	.211	75	.834	3.61E-02	.17	-.31	.38
	Equal variances not assumed			.226	74.541	.822	3.61E-02	.16	-.28	.35
RESP2	Equal variances assumed	2.260	.137	.017	75	.986	3.47E-03	.20	-.39	.40
	Equal variances not assumed			.017	59.592	.986	3.47E-03	.20	-.41	.41
MINI2	Equal variances assumed	9.650	.003	5.392	75	.000	1.67	.31	1.05	2.28
	Equal variances not assumed			5.793	74.296	.000	1.67	.29	1.09	2.24
SUNK2	Equal variances assumed	5.259	.025	5.856	75	.000	1.54	.26	1.01	2.06
	Equal variances not assumed			6.183	74.978	.000	1.54	.25	1.04	2.03
SUCC2	Equal variances assumed	.000	.992	1.010	75	.316	.34	.34	-.33	1.01
	Equal variances not assumed			1.023	69.869	.310	.34	.33	-.32	1.00
LIKE2	Equal variances assumed	1.299	.258	3.348	75	.001	1.11	.33	.45	1.77
	Equal variances not assumed			3.443	72.579	.001	1.11	.32	.47	1.75

Table 7.29a
Multiple Regression – Funding on all eight Problem-space Measures X1 to X2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.691	.657	17941.69

a. Predictors: (Constant), LIKE1, SUC1, IMPORT1, RISK1, MINI1, DISAP1, RESP1, SUNK1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.32E+10	8	6654314871	20.672	.000[a]
	Residual	2.38E+10	74	321904090.8		
	Total	7.71E+10	82			

a. Predictors: (Constant), LIKE1, SUC1, IMPORT1, RISK1, MINI1, DISAP1, RESP1, SUNK1

b. Dependent Variable: AMOUNT1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20693.895	20295.376		1.020	.311
	RISK1	-11278.7	2274.430	-.327	-4.959	.000
	DISAP1	4524.295	3512.755	.099	1.288	.202
	IMPORT1	-596.257	3590.867	-.012	-.166	.869
	RESP1	-1233.674	2696.066	-.037	-.458	.649
	MINI1	1730.768	1962.884	.075	.882	.381
	SUNK1	3538.187	2078.018	.153	1.703	.093
	SUC1	543.532	1682.321	.026	.323	.748
	LIKE1	12720.467	1678.101	.579	7.580	.000

a. Dependent Variable: AMOUNT1

Table 7.30a
Multiple Regression – Funding on all eight Problem-space Measures Y1 to Y2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.921[a]	.849	.833	14151.60

a. Predictors: (Constant), LIKE1, RISK1, IMPORT1, MINI1, RESP1, SUC1, DISAP1, SUNK1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.64E+10	8	1.080E+10	53.936	.000[a]
	Residual	1.54E+10	77	200267810.9		
	Total	1.02E+11	85			

a. Predictors: (Constant), LIKE1, RISK1, IMPORT1, MINI1, RESP1, SUC1, DISAP1, SUNK1

b. Dependent Variable: AMOUNT1

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-61538.3	14276.920		-4.310	.000
	RISK1	-1462.385	1648.162	-.043	-.887	.378
	DISAP1	1482.553	2808.597	.033	.528	.599
	IMPORT1	4370.684	2535.340	.096	1.724	.089
	RESP1	2448.389	2187.427	.066	1.119	.266
	MINI1	2437.057	1400.527	.103	1.740	.086
	SUNK1	3992.397	1683.998	.162	2.371	.020
	SUC1	-931.068	1360.777	-.041	-.684	.496
	LIKE1	16997.828	1401.221	.779	12.131	.000

a. Dependent Variable: AMOUNT1