UNIVERSITY OF SOUTHERN QUEENSLAND

IDENTIFYING AND MEASURING MANAGEMENT DEFICIENCY IN NON-PROFIT ASSOCIATIONS

A thesis submitted for the award of

DOCTOR OF PHILOSOPHY

By

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Abstract

The need to measure the performance of non-profit committees has been recognised for over 30 years primarily because of the direct relationship between committee performance and association performance but also because identifying management strengths and weaknesses across a range of performance factors forms the basis for an effective management development programme. The results of past studies are generally inconclusive leading to a lack of consensus as to which is the best approach. The objective for this study was to demonstrate that a heuristic methodology does produce an acceptable, approximate solution to the measurement of individual management performance in a non-profit committee. Testing established that the heuristic model produced a satisfactory solution and was able to provide a detailed assessment of management strengths and weaknesses across a wide range of factors. The solution produced by the model was validated by demonstrating that there was an alignment of the results produced by the heuristic model and those obtained by an alternate method.

Analysis of the results obtained from a sample of non-profit committee members provided clear evidence that management skills, management experience, relevant knowledge and commitment are key competencies for non-profit committee members. The level of deficiency in these factors will directly affect the level of individual and committee management deficiency. A direct, positive relationship between age and management performance was also identified. The findings suggest that, in general, the competencies required to manage the affairs of smaller non-profit associations are concentrated in one or two individuals. Within these individuals, a high level of experience gained from years of serving on the committee, combined with the accumulated knowledge of the association's culture, norms and management processes, forms the means by which the association is managed.

This research provides a platform from which the scope of the model can be extended to make it applicable to larger associations and provide global access to the model through the development of an on-line application. The heuristic methodology employed in this study could be used to find a solution to another important problem in the non-profit field: measuring the performance of a non-profit association in achieving its objectives.

Certificate of Thesis

I certify that the work contained in this thesis is my own, original work. I further certify that, to the best of my knowledge, this thesis contains no material that has been previously published or written by another person except where due acknowledgement and reference is made in the thesis to that work.

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Chapter 1. Introduction

1.1 Background

Definitions of the terms used in this research project are provided in Section 1.7.

The non-profit sector has experienced a period of sustained growth over the past decade and has now become an economically significant force in the economies of developed countries (Cornforth 2012, Langabeer & Galeener 2008). The last national survey of the non-profit sector in Australia was conducted in 2007/08 by the Productivity Commission (Productivity Commission 2010). The aim of the survey was to measure the contribution of the non-profit sector to the national economy. At that time there were 600,000 non-profit organisations in Australia, contributing 4% to GDP which equated to approximately $43 billion. Approximately 77,000 associations did not employ staff and were run entirely by volunteers. Nearly 5 million Australians volunteered their services to non-profit associations (NPAs) and contributed nearly $15 billion in unpaid work. In the United States approximately 1.5 million nonprofit organisations are registered with the Internal Revenue Service and it is estimated that the non-profit sector accounts for approximately 7% of GDP (Langabeer & Galeener 2008) and 8.3% of wages and salaries paid (The Urban Institute 2007). A US survey conducted by the Nonprofit Finance Fund (2014) found that 80% of NPAs reported an increase in demand for their services in 2014, which was the sixth consecutive year of increased demand.

NPAs are involved in a wide variety of areas including social welfare, education, emergency services, the environment, health care, sports, arts and culture. Even the smaller community based NPAs which work to create social connections for their members are considered by the Federal Government to play an important role in society (Productivity Commission 2010).

Unlike for-profit organisations which have a strong focus on producing profits, NPAs produce value that lies in the achievement of social purposes which form the mission of the association (Thach & Thompson 2007). The foregoing does not mean that non-profit associations are not interested in making a profit. Operating profitably ensures the financial viability of the association but, unlike for-profit organisations which distribute profits to their shareholders, NPAs do not distribute profits to their members.

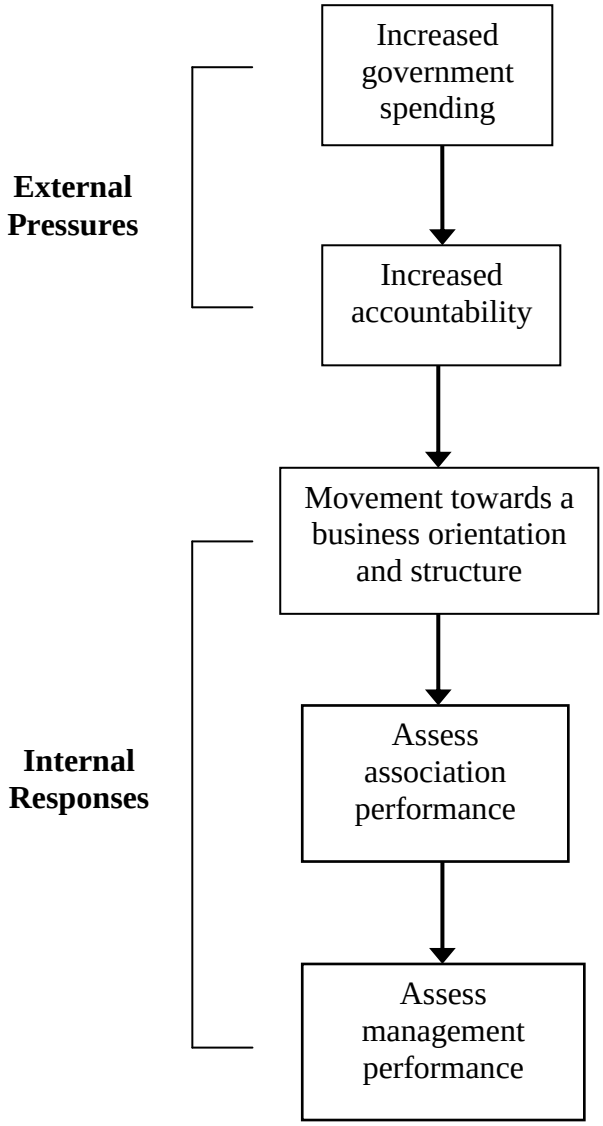
Rapid growth has seen the sector accounting for an increasing share of government spending due partly to a trend towards greater outsourcing of government services. All incorporated NPAs receive funding from government either directly, indirectly or both. Associations that do not receive a direct financial contribution still receive a benefit in the form of taxation concessions or a reduction in local government charges. For example, NPAs are exempt from Goods and Services Tax, they do not pay tax on any profit they make and they normally receive a substantial reduction in local government rates applied to any property they own. Therefore, as the non-profit sector expands, not only is the level of direct government funding increasing but the amount of revenue that governments forego is also increasing.
The management committees of NPAs are under greater scrutiny than ever before and are being held to higher levels of accountability (McDonagh 2006). NPAs in

receipt of government funding are under increasing pressure to demonstrate their achievements in delivering the community service that forms their mission (Australian Institute of Company Directors 2014; Greatbanks, Elkin & Manville 2010). This trend is expected to continue as governments outsource an increasing amount of their services through the third sector (McDonagh 2006). The Productivity Commission research into non-profit organisations (Productivity Commission 2010) found that there is an increasing call for NPAs to be more accountable in a financial sense, demonstrate the presence of business plans and produce demonstrable results. In the US, NPAs reported that more than 70% of funders requested some form of assessment of programme impact (Nonprofit Finance Fund 2014).

Despite the unique character and culture evident in NPAs (Herman & Renz 1999, Thach & Thompson 2007, Tucker & Parker 2013), the trends summarised above have created a growing movement within the non-profit sector towards adopting a more business orientation and structure which would make NPAs more aligned with for-profit organisations (Productivity Commission 2010, McDonagh 2006). This process will increase the need for reliable information that will enable NPA management teams to measure their own performance as well as the performance of the association in achieving its goals and objectives (McDonagh 2006).

Figure 1.1, below, illustrates the external pressures affecting NPAs. The driving force is the sector's increased share of government spending which is increasing the pressure on NPA management teams to be more accountable for the efficiency of their social programmes. Increased accountability is placing pressure on management teams to become more aligned with for-profit organisations and adopt a business orientation and structure which requires assessing the effectiveness of the association in achieving its goals. It also requires the management team to assess their performance and to work towards improving their ability to manage the association's affairs.

Figure 1.1. Current Trends Affecting Non-profit Associations.



The growing need for information to evaluate performance has resulted in the non-profit sector receiving a great deal of research attention. Early approaches to measuring NPA performance drew on the techniques that were then applied to measuring organisational performance in the for-profit sector. For example, Kaplan (2001) modified the Balanced Scorecard technique used in the for-profit sector to make it suitable for use in the non-profit sector. There is now broad agreement that the unique character and culture of NPAs makes for-profit techniques unsuitable to apply directly to the non-profit sector (Moxham 2012, Taysir & Taysir 2012, Tucker & Parker 2013). Characteristics of NPAs, such as their unique management structure, unique financial and legal status, distinct organisational culture, and objectives based on social or community service values, makes the measurement of

management and organisational performance more complex than in for-profit organisations (Tucker 2010).

1.1.1 Measuring Non-profit Association Performance

A widely held view has emerged that measuring association performance must focus on achievement of the objectives contained in the mission statement (Epstein & McFarlan 2011). The mission is the reason the association exists and it is typically to provide some form of community service. What complicates the measurement problem is the mission or objectives are often intangible and difficult to measure (Forbes 1998). Researchers found that rather than try to measure mission, a better approach more likely to succeed is to concentrate on identifying the goals that will lead the association towards achievement of the mission (Forbes 1998). Properly conceived, the goals will ensure that the association remains aligned with its mission over the long term. This approach led to the development of a variety of input/output models (Bagnoli & Megali 2011, Packard 2010, Sawhill & Williams 2001) which attempted to map processes from the input of various resources through to the ultimate impact on the broader community of programmes and activities. Input/output models did not receive wide acceptance as the best approach because the technique has to be tailored to each individual association, there is a long time lapse before any results become available and producing a measurement of the different elements that comprise input/output models proved to be difficult (Heiberg & Bruno-van Vijfeijken 2009).

Many researchers favoured a multi-dimensional approach which was based on identifying the factors or dimensions that are positively associated with organisational performance (Baruch & Ramalho 2006, Bagnoli & Megali 2011, Forbes 1998, Herman 1990, Sowa, Selden & Sandfort 2004, Taysir & Taysir 2012). Data was collected from the chief executive officers of large NPAs using either personal interviews or self-administered questionnaires. A common technique was to ask the CEO to rate, in order of importance, the factors that are important for good organisational performance. Despite the development of many multi-dimensional models, no single technique has emerged as the preferred approach and there is no agreement as to which set of factors should be included in a model (Herman 1990, Lee and Brower 2006, Moxham 2010, Taysir & Taysir 2012). Although the findings from these studies are referred to as models they do not present a technique for actually measuring performance. Techniques are not provided for measuring each identified factor nor are the relationships between the factors and association performance established. As a result, measuring the performance of NPAs remains an area requiring further investigation (Lecy, Schmitz & Swedlund 2011, Willems, Huybrechts, Jegers, Weijters, Vantibborgh, Didee & Pepermans 2012).

A summary of past approaches to measuring association performance is provided in Chapter 2.

1.1.2 Measuring NPA Management Deficiency

The subject of management deficiency appears in a number of reports as being responsible for major problems, even disasters, in a number of areas such as business failures (Risk Alert 2013), environmental programme management (Stabroek News

2007), mine management (Queensland Department of Employment, Economic Development and Innovation 2011, World Information Services on Energy 2014) and the management of public utilities (Management Deficiency Report: Public Building Service 2010). At the overall board level, the main management deficiencies associated with business failures have been identified as:

1. Poor financial control.
2. Management skills not balanced across the executive team.
3. A lack of management experience.

(Risk Alert 2013)

In the US it is estimated that more than 100,000 NPAs will have failed over a two year period from 2012 to 2014 (Griesmann, D. 2012). Even though management deficiencies are the single most critical cause of business and NPA failures (Productivity Commission 2010, Risk Alert 2013), no references could be found in the literature to research studies that have attempted to measure individual management deficiencies in any economic sector. Therefore, this section will provide background information based on references for measuring management performance.

Following the same development path as non-profit association performance research, the initial approach to measuring management performance in the non-profit sector again drew on the techniques that were then applied to measuring performance in the for-profit sector. This approach met with more success than it did when applied to measuring overall association performance (Thach & Thompson 2007). Despite this early optimism, researchers became increasingly concerned that the techniques used to measure management performance in the for-profit sector did not take into account the cultural differences that exist between for-profit and non-profit organisations and the effect these cultural differences have on measuring the performance of non-profit management teams (Goodman, Atkins & Schoorman 1983).

There is considerable support in the literature for using a multi-dimensional approach using two or more factors to measure management performance, as there is no single factor that can embrace the complex nature of non-profit committees and the individuals that comprise them (Brown 2007). Many multi-dimensional models are documented in the literature (Balduck, Rossem & Buelens 2010, Cornforth 2012, Ostrower & Stone 2010) but there is no agreement that one model is better than another and researchers cannot agree on which set of factors should form a model. It is also noted in the literature that the findings from one study sometimes do not support the findings of another study (Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Cornforth 2012, Holland, Chait & Taylor 1989, Ostrower & Stone 2010). As was the case for studies investigating overall association performance, the findings from these studies are referred to as models but they do not present a technique for actually measuring management performance. They fail to provide techniques for measuring the identified factors and the relationship between the factors and management performance is not established. These studies also fail to provide an assessment of the strengths and weaknesses of individual committee members yet this is the actionable information that NPA management teams need to improve their performance (McDonagh 2006). A summary of past approaches to measuring management performance is provided in Chapter 2.

What has emerged from this research is a better understanding of the factors that contribute to management performance but no single solution technique for measuring the performance of non-profit management teams has emerged as the preferred option (Alexander, Hearld & Mittler 2011). More recently, researchers have become aware of the need to study management performance at the individual committee member level with a focus on individual contributions but to date no progress has been made in this area (Doherty & Hoye 2011).

1.1.3 Concluding Remarks

Despite the vast amount of research that has been conducted around the world into measuring association and management performance in the non-profit sector, the research findings are generally inconclusive leading to a lack of consensus as to the best approach to adopt (Lecy, Schmitz & Swedlund 2011, Taysir & Taysir 2012). Lee and Brower (2006) describe the literature as being "characterised by controversy, confusion and ambiguity" leaving NPAs with narrowly designed performance measurement models that do not fully address the multi-dimensional nature of the measurement problem (Cornforth 2012). The above findings provide evidence that NPA management teams lack the information they need to assess their own performance and their association's progress towards the achievement of its goals.

1.2 The Research Question

In the preceding section the need to find a reliable measure of management performance in the non-profit sector was established and the lack of success in finding a single measurement technique that has wide support was highlighted. There is generally a positivist orientation to the current approach to measuring management performance (Cornforth 2012), looking at a range of matters a committee should be dealing with and how well they go about this task. This research project adopts a different approach and focuses on individual management deficiency. The justification for choosing deficiency as the dimension of management performance to be measured is presented in the next section. The background information provided leads to the formation of the question that this research project attempts to answer:

Does heuristic methodology provide an acceptable, approximate solution to the measurement of management deficiency in a non-profit association?

1.3 Justification of the Study

1.3.1 Justification of the Focus on Deficiency

Management performance has more than one dimension so a decision had to be made as to which aspect of management performance should be measured. The

decision was based on determining which aspect would deliver the greatest benefit to a NPA.

Management deficiencies are the single most critical explanatory factor in business failures (Nicholson, Newton & McGregor-Lowndes 2012, Productivity Commission 2010, Risk Alert 2013). Management deficiencies can prevent an organisation from effectively anticipating, responding and adapting to changing business conditions and set the organisation up to make critical mistakes (Risk Alert 2013). It is estimated that 70% of business failures are attributable to management deficiencies of which the major identifiable factor is the absence of serious planning and control (Risk Alert 2013).

The Contribution of Not-for-profit Organisations report (Productivity Commission 2010) cites a study by the Business Reconstruction & Insolvency firm BRI Ferrier (2009) which found that most NPA failures are the result of weak, inexperienced management. In other words, management deficiencies, particularly deficiencies in management skills and management experience, are the primary cause of NPA failures. The findings presented above establish management deficiency as the most critical factor explaining both business failures in the for-profit sector and the failure of non-profit associations and support the focus on deficiency adopted in this study. It follows that the greatest benefit to an NPA will come from identifying management deficiencies and working to overcome those deficiencies.

Another consideration was that two of the factors identified as being associated with management performance, age and resistance to change, are measured directly in terms of deficiency. The effect of increasing age on management performance, for example, is logically measured in terms of management deficiency. Therefore, in order to have a consistent approach, the measurement of all of the factors needs to be in terms of deficiency.

There is also support in the literature for adopting a focus on management weaknesses or deficiencies. In an investigation into poorly performing boards, Salamon and Chinnock (2004) expressed the view that an important challenge facing boards is the appropriate diagnosis of their weaknesses saying that little has been done to ensure the reliable diagnosis of problems facing non-profit boards. Boards that carry out some form of performance assessment, examining their practices and processes in a way that looks for areas where improvement is possible, are in a better position to increase overall organisational performance (Overell 2011). This evidence adds further support for a focus on measuring management deficiency as that approach delivers the actionable information that NPAs need to identify areas of weakness and, by working to overcome these weaknesses, improve their management performance.

1.3.2 Justification of the Need to Measure Management Deficiency

Figure 1.1 illustrated the current trends that are affecting NPAs. Of the three trends identified and illustrated in the chart, increased accountability is the trend that is driving the need for performance measurement, both at the management and association level. The limitations of past approaches to measuring management performance (see the summary of past approaches in Chapter 2) have left NPA

management teams without the information they need to assess their performance, identify individual committee member management deficiencies and tailor a management development programme to address the identified deficiencies. Management committees need a practical, reliable technique that will provide them with the actionable information they need to assess their performance in moving the association towards the achievement of its mission (McDonagh 2006).

A thorough search of the literature failed to find any reports of research that:

1. Attempted to measure individual management deficiency in any economic sector.
2. Adopted a heuristic modelling approach to measure management deficiency which is the basis of this study.

This research project aims to:

1. Develop a heuristic model that produces an acceptable, approximate solution to the measurement of individual management deficiency.
2. Provide a practical, reliable performance measurement tool that, with further development, NPA management committees could use to identify deficiencies in the competencies of individual committee members.

1.4 Uniqueness of the Study

This study is unique in two ways. Firstly, it adopts a micro-level approach, investigating management deficiencies at the individual committee member level, rather than at the overall management committee level which is characteristic of the current approach. A micro-level approach provides information that will enable a management committee to identify deficiencies in individual committee member competencies and take corrective action that adds to the process of management development and leads to improved committee performance. Secondly, it adopts a heuristic modelling approach to measure individual management deficiency. This choice was made because it has been established that in a research environment where traditional analytical techniques have failed to produce a widely accepted solution to the measurement of NPA management performance (Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Cornforth 2012, Holland, Chait & Taylor 1989, Ostrower & Stone 2010), a heuristic approach may produce an acceptable, approximate solution (Satoglu, Durmusaglu & Ertay 2010).

1.5 Objectives and Goals of the Research Project

The overall objective set for this project was to follow a standard heuristic methodology to build a model that produces an acceptable, approximate solution to the measurement of management deficiency in NPAs. The specific goals that were set to achieve the objective were:

1. Identify and quantify the factors that contribute to management deficiency in NPAs.
2. Use the identified factors to build a heuristic model to measure individual management deficiency in NPAs.

3. Demonstrate that the heuristic model produces an acceptable, approximate solution to the measurement of management deficiency.

To build the model the established heuristic modelling technique known as simulated annealing was the methodology adopted. Simulated annealing is a mathematical technique which has been applied to find approximate solutions to complex problems across a wide range of applications (Kirkpatrick, Gelatt & Vecchi 1983). This methodology is presented in Chapter 3.

To demonstrate that the heuristic model produces an acceptable, approximate solution to the measurement of individual management deficiency, it was necessary to validate the findings from the model by establishing that there is alignment of the model results with an assessment of individual management deficiency obtained by an alternate technique. A technique using individual committee member performance ratings was developed to carry out validation of the model's results.

1.6 Significance of the Research

Earlier in this chapter the size and economic importance of the non-profit sector was established. It was also established that NPA management teams need a practical, reliable technique that will enable them to measure their own performance. They need actionable information that will enable them to identify management deficiencies and take corrective action given that weak, inexperienced management has been identified as the major factor contributing to NPA failures (Productivity Commission 2010).

A review of the literature found that past approaches to measuring both management and association performance (see the summary of past approaches in Chapter 2) have produced findings that are generally inconclusive leading to a lack of consensus as to which is the best approach (Herman 1990, Taysir & Taysir 2012). There is no agreement that one model is better than another and the findings from one study sometimes do not support the findings of another study (Cornforth 2012; Ostrower & Stone 2010; Barnard & Lesirge 2012; Bhardwaj & Vuyyuri 2005; Holland, Chait & Taylor 1989). Many studies treat the subject of measuring management performance as if nothing relevant has been achieved in the past. It is claimed that there is little evidence of researchers building on the accumulated knowledge contained in the literature (Baruch & Ramalho (2006).

One can conclude from the findings presented above that past attempts to measure management performance using traditional analytical methods have failed to produce a widely accepted model that can provide a solution to the measurement problem. This research project aims to fill this gap by developing a technique that is simple to apply and provides actionable information that assists management teams to identify individual deficiencies.

This project also adopted an approach that is unique in three ways. Firstly, the heuristic methodology known as simulated annealing was adopted to measure management deficiency. The review of the literature presented in Chapter 2 found clear evidence that in a situation where an analytical solution to a problem is overly complex, unrealistically time consuming in computational terms or where no solution at all can be found by traditional methods, a heuristic approach may provide

an acceptable, approximate solution (Chen & Li 2008, Dawande, Gavirneni & Tayur 2006, Yang, Karaesmen & Keskinocak 2008, Zeng, Costello & Hodgson 2010). A thorough search of the literature failed to find any report of a heuristic approach being used to measure management performance in any economic sector.

Secondly, the focus of the research is on management deficiency. As was presented earlier in Section 1.3.1, deficiency in management abilities, specifically weak and inexperienced management, is directly associated with NPA failures (Nicholson, Newton & McGregor-Lowndes 2012, Productivity Commission 2010). Because of the direct relationship between management committee performance and association performance, strengthening management committee performance is widely recognised as being of major importance to the achievement of the organisation's goals and objectives (Brown 2007, Jackson & Holland 1998, Kerr & Gade 1989). While building on strengths can be a process that contributes to better performance, overcoming weaknesses has the potential to make a greater impact on improving performance. This view is supported by Willems et al (2012) who drew the conclusion that future research should focus on management shortcomings as such an approach would provide information to enable direct action to be taken where most needed. The findings presented above support the conclusion that the focus should be on management deficiency as that produces the practical, actionable information that NPA management teams need.

The third point of uniqueness is that the research focuses on deficiencies in individual committee members rather than investigating the committee as a whole. Identifying management weaknesses in individual committee members will provide management teams with the actionable information they need to improve their performance. Brown (2007) made the point that the competencies of individual board members have not been universally established and that the majority of NPA research into management performance has focussed on group level indicators of performance rather than individual committee member performance indicators.

In summary, this research is significant because it clearly identifies the factors associated with non-profit management performance, provides a solution to the long standing problem of measuring non-profit management performance and, with further development to broaden its scope and provide online accessibility, it will provide NPA management teams with a timely, simple to use technique that will deliver the actionable information they need. This research also provides a platform from which a model to solve the problem of measuring non-profit association performance can be developed.

1.7 Definitions

This section presents a definition of the terms used in the research project.

1.7.1 Incorporated Association

Incorporation is governed by State and Territory legislation so there can be slight variations due to jurisdiction. In general, an incorporated association must have at least five members and be formed for a specific purpose which conforms to the

eligibility guidelines laid down by the relevant jurisdiction (Productivity Commission 2010).

The specific purpose is usually a community based one which can be as simple as a group of hobbyists from a local community who share a common interest or it may be an important community welfare service delivered by a large national, even internationally based, organisation.

1.7.2 Non-profit Association (NPA)

A non-profit association is an association that does not distribute profits to its members. For an association to become incorporated it must be a non-profit association. NPAs are sometimes referred to as not-for-profit associations and in other countries the use of nonprofit rather than non-profit and organisation rather than association is quite common. This project focuses only on incorporated, non-profit associations that are run entirely by volunteers.

1.7.3 Management Committee

In Australia, the most common terminology used for the team of people managing the affairs of an NPA is management committee as this terminology is used in relevant State and Territory legislation. Other countries prefer to use board, board of directors or board of trustees. An Australian NPA may adopt one of these terms for their own internal use which is a common practice for large NPAs. A management committee may also be referred to a management team.

In Australia, three members of the management committee, president, secretary and treasurer, must be elected at the association's Annual General Meeting. Individual associations can add to the number of elected committee positions with vice-president being a common addition. A management committee is defined as a collection of individuals who are independent in their tasks and who share responsibility for the design, control and development of an association (Cohen & Bailey, 1997, Schwaninger, 2010).

1.7.4 Association Performance

Association performance is defined as the productive effect of the outcomes of an association and the competent and capable manner in which it goes about achieving sustainability and the objectives that form its mission.

1.7.5 Competency

A competency is an individual characteristic that distinguishes superior from average performers (Spencer, L. M., 1993).

1.7.6 Individual Management Deficiency

Individual management deficiency is defined as the extent to which an individual management committee member is deficient in the management skills, management experience, relevant knowledge and personal attributes required to carry out their individual responsibilities and shared responsibilities in a capable and competent manner.

1.7.7 Committee Management Deficiency

Committee management deficiency is defined as the combination of the individual committee members' level of deficiency.

1.7.8 Multi-dimensional

Multi-dimensional refers to the existence of two or more dimensions associated with management performance. The dimensions may also be referred to as variables, factors, categories or characteristics.

1.7.9 Modelling and Heuristics

1.7.9.1 Model

A model is defined as "an abstract, conceptual system by which a concrete system is represented" (Schwaninger, 2010). Basically, a model provides a process or set of steps to follow to solve a specific problem.

1.7.9.2 Model Framework

A model framework provides "dimension and categories which enable a rough overview and a structuring of the problem to be undertaken" (Schwaninger, 2010). The model framework provides the basis or groundwork from which variables or factors are identified and upon which the model will be constructed.

1.7.9.3 Heuristic

The word "heuristic" comes from the Greek word "heuriskein" meaning "to find or discover". It was first used in psychology where it is defined as a mental shortcut that allows people to solve problems and make judgements quickly and efficiently (Leong & Hensher, 2012). There are many different types of heuristic methodologies which have evolved from the basic concept of a heuristic found in the psychology

literature. In mathematics, heuristics refers to experienced based techniques for problem solving and learning that provide a solution to a problem that is not necessarily optimal (Wikipedia On-line Encyclopaedia, 2013). A definition which reflects the broad mathematical application of heuristics to problem solving would be more appropriate here. To that end a heuristic is defined as a decision rule that assists in achieving an approximate solution to a specific problem (Read, Grushka & Cockayne, 2011).

1.7.9.4 Heuristic Model

A heuristic model is a model which employs heuristics to find a solution to a specific problem. The heuristic model may simplify the problem by relaxing some of the problem's constraints. With a heuristic model there is no guarantee that the best or optimal solution will be found (Read et al., 2011) but the heuristic model may provide an acceptable, approximate solution to a problem when no single, analytical, solution technique has emerged (Satoglu, Durmusoglu & Ertay, 2010). Hence, the focus of this research project is on a heuristic model rather than an algorithmic model. Information on established heuristic modelling techniques and the application of heuristic modelling to problem solving is provided in the review of the relevant literature in Chapter 2, Section 2.4.

1.8 Scope and Limitations of the Study

This study is limited to incorporated non-profit associations run entirely by volunteers. The region from which a sample of NPAs was drawn was limited to the State of Queensland. In Queensland there were approximately 20,000 incorporated associations in 2012 (Source: Office of Fair Trading, Attorney-General's Department, Queensland Government, 2013).

Section 1.1 detailed the wide variety in the range of activities in which NPAs are involved and the significant economic importance of the larger NPAs. In addition to their management committee, large NPAs may have an executive management team on the payroll which performs many of the routine management tasks undertaken by the management committee in smaller NPAs. This structure brings additional staff related factors into consideration such as committee/staff relations and additional reporting requirements. Incorporating additional factors into the model to broaden the scope of the model should not present a major problem after the basic model has been developed and tested but to do so at this formative stage would add an unnecessary complication to the development of the technique. Therefore it was necessary to further limit the scope of this study to:

1. The smaller NPAs run entirely by volunteers with no paid staff.
2. A homogenous subset of the smaller NPAs.

The subset selected was art societies and similar art related associations. In 2012 there were 101 incorporated associations in this category in Queensland (Source: Office of Fair Trading, Attorney-General's Department, Queensland Government, 2013). This subset was selected for two reasons. Firstly, art societies vary considerably in size, assets and social impact. Some art societies have been

established for several decades or even longer, have over 100 members, own the facility they use, are financially secure and conduct an active programme of art and social activities for their members and the broader community. At the other end of the spectrum are societies which do not own the premises they use, struggle to remain financially viable and suffer from internal conflicts and self interests which limit their ability to achieve the community purpose for which they were established.

Secondly, this researcher has extensive knowledge of, and experience in, the management of an art society gained from serving on an art society management committee over a seven year period from 2007 to 2014. This knowledge and experience provided valuable information that was used in the identification of management committee responsibilities and assisted the process of identifying the competencies and personal attributes required for good performance in management committee roles.

Another limitation of the study is that the findings are based primarily upon the perceptions of the individuals who participate in the study rather than on a purely quantitative analysis. It is most likely that some degree of response bias exists in the data collected even though steps were taken in the design of the data collection instrument to minimise the effect of response bias. It was necessary to develop a technique to provide an estimate of response bias which was built into the heuristic model.

1.9 Outline of Thesis

This thesis is divided into nine chapters. In Chapters 1 and 2 the introduction to the research project and the review of the literature are covered. In Chapter 3 the factors associated with management performance are identified and techniques developed to quantify them. Chapter 4 presents the process for developing the initial form of the heuristic model. In Chapter 5 the process of carrying out refinements to the model following the simulated annealing heuristic modelling development process is covered. Chapter 6 presents the steps taken to carry out the initial validation of the solution produced by the model using data collected from a pilot study. Chapter 7 outlines the data collection process and Chapter 8 presents the analysis of the data collected by the postal survey. The last chapter summarises the main findings from the research project and presents recommendations for further development and research.

1.10 Conclusion

The non-profit sector is increasing in size and economic importance in most developed countries (Cornforth 2012, Langabeer & Galeener 2008). An increase in government funding for the sector has resulted in calls for each NPAs to be more accountable for the performance of its management team and the performance of the association in moving towards the achievement of its mission (Greatbanks, Elkin & Manville 2010, Productivity Commission 2010). Management teams need a practical, reliable technique that will enable them to measure their own performance and that of the association they govern. They also need actionable information that

will enable them to identify weaknesses and take corrective action (Nicholson et al 2012) given that weak, inexperienced management has been identified as the major factor contributing to NPA failures (Productivity Commission 2010).

A review of the literature found that the current approach to measuring management deficiency has failed to produce a technique that is widely accepted as the best approach (Moxham 2010, Tucker 2012). Essentially, attempts to measure performance using traditional analytical methods have failed to find a satisfactory solution to the measurement problem (Cornforth 2012, Ostrower & Stone 2010, Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Holland, Chait & Taylor 1989).

Satoglu, Durmusaglu & Ertay (2010) found that a heuristic approach can provide acceptable, approximate results when the search for a solution using traditional analytical methods has not been successful. There is also considerable support in the literature across a wide range of applications that a heuristic approach should be considered when the number of variables is large and the relationship between the variables is unknown (Gilli & Schumann 2012, Satoglu, et al. 2010, Tempelmeier & Buschkuhl 2009). These findings clearly indicate that a heuristic methodology can be used to find acceptable, approximate solutions to complex, multi-variable problems where traditional analytical methods have either:

1. Failed to produce a solution technique that is universally acceptable.
2. Been able to produce a solution but the time required and/or computational resource requirements are unacceptable.
3. Failed to produce any solution at all.

Therefore, it was reasonable to conclude that a heuristic approach should be adopted for this study.

The overall objective of this project was to develop a technique that can produce an acceptable, approximate solution to the measurement of management deficiency in NPAs. In order to achieve the research objectives a detailed analysis of the current approaches to measuring management deficiency was required. This analysis provided the foundation for designing a model framework, identifying the factors and building a heuristic model to measure management deficiency. Chapter 2 presents the review of the relevant literature.

Chapter 2. Literature Review

2.1 Introduction

The objective of this chapter is to carry out a detailed review of the literature relating to non-profit associations, measuring association performance, measuring management performance and heuristic modelling. The focus of this review is on the current approach to measuring association and management performance and the application of heuristic modelling to problem solving.

2.2 Non-profit Association

The non-profit sector in developed countries is large and growing. Langabeer & Galeener (2008) reported that 7% of GDP flows through the United States' non-profit sector and it is estimated that 1.5 million NPAs are registered with the Internal Revenue Service (The Urban Institute 2007). The latest information available shows Australia had approximately 600,000 non-profit organisations in 2007/08, contributing over 4% to GDP which equated to about $43 billion (Productivity Commission 2010). The sector grew at an average annual rate of 7.8% over the seven years to 2007 and receives billions of dollars in tax exemptions and direct government funding. The larger non-profit organisations, which then numbered around 59,000, are considered to be economically significant and account for around 8% of employment nationally. In 2007/08 nearly 5 million Australians volunteered their services to NPAs and contributed nearly $15 billion in unpaid work (Productivity Commission 2010). In the State of Queensland there were approximately 20,000 incorporated associations in 2012 (Source: Office of Fair Trading, Attorney-General's Department, Queensland Government).

The Productivity Commission research report into the sector (Productivity Commission 2010) found that many NPAs do not operate as economic entities in the market. Their purpose is to deliver services to their members, clients or to the community more broadly, in such areas as welfare, vocational guidance, education, sports, arts, worship, culture, health, emergency services, business and professional associations, research, housing, the environment and a large number of other miscellaneous groups. The rank order of these areas, based on the number of organisations involved, was:

1. Religion
2. The environment
3. Culture and recreation, which includes sporting groups
4. Social services
5. Education and research

The research report also found that smaller, community based associations play an important role in creating social connections for their members and strengthening civil society. The Federal Government, through its policy of social inclusion, has recognised that community based non-profit associations play an important role in overcoming social exclusion and enhancing the economic, social, cultural and environmental wellbeing of society. Greatbanks, Elkin and Manville (2010) also found that NPAs perform a significant role in modern society.

NPAs produce value that lies in the achievement of social purposes (Thach & Thompson 2007). For each NPA their social purpose forms the mission of the association. Management teams focus on the community value to be created and the operational capacity to deliver that value, as well as providing general management support to the organisation.

Tucker and Parker (2013) identified three characteristics of NPAs that differentiate them from for-profit organisations:

1. The unique culture of NPAs with their value and service orientation.
2. A fundamental concern for people and the community at large.
3. NPAs place a higher value on helping people than on doing so in an efficient manner.

The last point refers to some NPA activities being quite labour intensive.

In contrast to for-profit organisations where management control systems are often set in firm policies and procedures, NPAs often have a more informal management control system which is characterised by social interactions and unwritten policies and procedures that are interpreted informally as rules and procedures to be followed. Shared values, norms, beliefs and traditions, derived from the organisation's culture, guide management behaviour (Tucker & Parker 2013).

Herman and Renz (1999) found that a unique organisational culture is a major factor that distinguishes NPAs from for-profit organisations. Thach and Thompson (2007) also noted that a different type of culture exists within NPAs. They found that the missions of NPAs are often vague and conflicting and they generally do not have enough resources to fully achieve their goals. This creates a need for leadership that can deal with complex issues that arise from working to achieve the broader goals and objectives of the mission.

It is claimed that the management teams of NPAs are under greater scrutiny than ever before and are being held to higher levels of accountability (McDonagh 2006). NPAs in receipt of government funding are under increasing pressure to demonstrate their achievements (Greatbanks, Elkin & Manville 2010). This trend is expected to continue as governments outsource an increasing amount of their services through the third sector (McDonagh 2006). The Productivity Commission research into non-profit organisations (Productivity Commission 2010) found that there is an increasing call for NPAs to be more accountable in a financial sense, demonstrate the presence of business plans and produce demonstrable results. McDonagh (2006) also found there was a growing movement within the non-profit sector towards a private, for-profit sector business orientation and structure. This movement has increased the need for reliable information which will enable better performance measurement and lead to an improved understanding of a

NPAs effectiveness in carrying out its activities and achieving its goals and objectives.

The unique character of NPAs presents them with unique problems. NPAs often have less access to human resources, specifically knowledge, skills and abilities that are crucial to their survival (Tucker & Parker 2013). Further to this point, Thach and Thompson (2007) noted that performance incentives are inadequate or non-existent in the sector. Commercial expertise is also likely to be less available yet NPAs often face the challenge of uncertainties associated with unpredictable income streams which make managing revenues and expenses more difficult than in for-profit organisations (Tucker & Parker 2013). The sustainability of an NPA depends on its ability to:

1. Engage the community in supporting its purpose.
2. Generate sufficient revenue to meet its operating expenses.
3. Allocate resources in ways that ensure the efficient achievement of its purpose.

(Productivity Commission 2010).

Tucker and Parker (2013) identified three main sources of revenue for NPAs:

1. Private contributions: individual, business and corporate donations.
2. Public support: government tax concessions and funding grants, local government financial assistance through rate concessions and direct funding and support of activities.
3. Commercial activities: user fees, membership fees, sale of products and services.

The Not-for-Profit Governance and Performance Study conducted by the Australian Institute of Directors (2014) claims that school boards are facing increased challenges. The study found that managing uncertainty in government funding has made protecting the board's reputation and assessing their performance top priorities. The study also found that, for all non-profit boards, responding to change and uncertainty in government policy has become a top priority.

In summary, the non-profit sector is growing rapidly and accounting for an increasing share of government spending as the trend towards greater outsourcing of government services continues (McDonagh 2006). These trends are bringing the sector under greater scrutiny with associated calls for greater management accountability to demonstrate the effectiveness of their activities to achieve the association's community service (Nonprofit Finance Fund 2014; Greatbanks, Elkin & Manville 2010). This process will increase the need for reliable information that will enable NPA management teams to measure performance against objectives (McDonagh 2006). Despite the unique character and culture evident in NPAs, there is a movement towards adopting a more business orientation and structure which would make NPAs more aligned with for-profit organisations (Productivity Commission 2010, McDonagh 2006).

2.3 Measuring Association Performance

This section will provide a review of the literature relating to measuring the performance of non-profit associations. In the literature, non-profit associations are often referred to as non-profit organisations and committees are often referred to as boards. Alternative terminologies are summarised in Table 2.1.

Table 2.1. Terminology

Term	**Alternatives Found in the Literature**
association	organisation
committee	board board of directors board of trustees management team
non-profit	nonprofit not-for-profit

Early approaches to measuring NPA performance drew on the techniques that were then applied to measuring organisational performance in the for-profit sector. Kaplan (2001) modified the Balanced Scorecard technique used in the for-profit sector to make it suitable for use in the non-profit sector. It is basically a process for measuring progress over time toward achieving strategic objectives. The scorecard has to be tailored to an organisation to help it focus on the outcomes of operational actions needed to achieve its objectives. The technique uses a number of performance measures that can be regularly reviewed by management to track the performance of the organisation. The financial measures developed for the for-profit sector were supplemented with new measures which covered customer service, internal processes and learning and growth. Initially there was quick acceptance of the Balanced Scorecard as a management tool, particularly amongst the larger NPAs, but the suitably of the technique in a broad sense has been questioned. The difficulty in producing reliable performance measures for non-profit organisations which the technique requires, can lead to unexpected and often dysfunctional results (Norreklit, Jacobsen, & Mitchell 2008).

A great deal of research has been carried out over the past three decades which has contributed to the debate as to whether for-profit techniques can produce a meaningful solution to measuring performance in the non-profit sector (Greatbanks, Elkin & Manville, 2010). There is now broad agreement that the

unique character and culture of NPAs makes for-profit management performance measurement techniques unsuitable to apply directly to the non-profit sector (Moxham 2012, Taysir & Taysir 2012, Tucker & Parker 2013).

Herman and Renz (2002) claimed that organisational performance should not be measured using just one factor, or dimension. Such an approach is referred to in the literature as a uni-dimensional approach and is usually based on financial indicators (Baruch & Ramalho 2006). Instead, a multi-dimensional approach is required which involves a number of factors that are positively associated with organisational performance. For this approach, data was collected from the chief executive officers of large NPAs using either personal interviews or self-administered questionnaires. A common technique was to ask the CEO to rate, in order of importance, the factors that are important for good organisational performance. Herman and Renz (2002) found that high performing NPAs are more likely to use sound management practices. They listed 8 management practices that are related to organisational performance:

1. Measuring member satisfaction.
2. Strategic planning.
3. A board development programme.
4. A clear statement of goals.
5. Policies and procedures documented in a manual.
6. Orientation for new board members.
7. Role descriptions.
8. Board performance evaluation.

They noted that the importance of these factors to measuring organisational performance may depend on the organisation's field of interest. They also found that measuring organisational performance by assessing programme outcomes is limited and may be misleading.

Many other studies support the view that a multi-dimensional approach to the measurement of association performance is required (Baruch & Ramalho 2006, Bagnoli & Megali 2011, Forbes 1998, Herman 1990, Sowa, Selden & Sandfort 2004, Taysir & Taysir 2012). For this reason, the uni-dimensional nature of theoretical approaches inherent in techniques such as agency theory (Miller 2002) are now broadly considered to be inadequate for measuring NPA performance (Tucker 2010). Despite the development of many multi-dimensional models, there is no agreement as to which set of factors should be included in a model (Herman 1990, Lee and Brower 2006, Moxham 2010, Taysir & Taysir 2012). It is also evident from the review of the literature that, although the findings from these studies are referred to as models, they do not present a technique for actually measuring performance. Techniques are not provided for measuring the identified factors nor is the relationship between the factors and organisational performance established. As a result, assessing the performance of NPAs remains an area requiring further investigation (Lecy, Schmitz & Swedlund 2011, Willems, Huybrechts, Jegers, Weijters, Vantibborgh, Didee & Pepermans 2012).

Baruch & Ramalho (2006) also noted that, despite the current tendency to favour a multi-dimensional approach, a persistent uni-dimensional approach, with an over-emphasis on purely financial variables, was evident in the literature. Consequently, some researchers believe there has been a lack of development and

sophistication in non-profit organisational performance research (Greatbanks et al 2010).

Characteristics of NPAs, such as their unique management structure, unique financial and legal status, distinct organisational culture and objectives based on social or community service values, makes the measurement of organisational performance more complex than in for-profit organisations (Tucker 2010). The multi-dimensional nature of measuring NPA performance, which involves identifying the factors or variables that are contributing to association performance, led to the development of multi-dimensional frameworks to assist in identifying the factors (Sawhill & Williams 2001). Mwenja and Lewis (2009) support the view that organisational performance has to be measured in terms of a framework that looks at factors such as overall success in achieving the organisation's goals and objectives, the level of satisfaction of the members and the broader community served by the organisation and the increase or decrease in the number of programmes offered. Moxham (2010), in a review of the NPA literature, found that NPA performance measurement over the past 30 years has focussed on developing a measurement framework that aims to identify the wide range of factors that can contribute to organisational performance. She claims the multi-dimensional technique overcomes the shortfalls associated with purely financial performance measures. She also supports the view, widely subscribed to in the literature that developing meaningful performance measures for NPAs is complex, and although much work has been carried out on developing suitable measurement criteria and processes, no definitive conclusions have been reached. She reached the conclusion that the large number of different performance measurement techniques indicates a lack of consensus as to how performance should be measured.

While research on measuring NPA performance does not seem to support any general conclusions as to the best approach (Tucker 2012), there is a widely held view that measuring organisational performance must focus on achievement of the objectives contained in the mission statement (Epstein & McFarlan 2011). The mission is the reason the association exists and it is typically to provide some form of community service. What complicates the measurement problem is the mission or objectives are often intangible and difficult to measure (Forbes 1998). Epstein and McFarlan (2011) also noted that non-financial measures of success are often less precise and far more difficult to measure. They found that although it is important for non-profit organisations to measure performance in relation to both their financial performance and their performance in meeting the organisation's objectives, current practice in performance measurement against achievement of mission has been weak.

Researchers have found that rather than try to measure mission, a better approach more likely to succeed is to concentrate on identifying the goals that will lead the organisation towards achievement of the mission (Forbes 1998). Properly conceived, the goals will ensure that the organisation remains aligned with its mission over the long term. Sawhill and Williamson (2001) support this approach. They emphasised that the goals should be concrete and measureable. They also found that using measureable goals can help overcome internal opposition to management initiatives.

The focus on goal achievement led to the development of input/output models to measure performance. Bagnoli and Megali (2011) developed an input/output technique consisting of four categories: inputs, outputs, outcomes and impacts, which had a heavy reliance on financial measurement. Epstein and McFarlan developed this technique further by adding activities to the mix. The five categories mapped the organisation's resource gathering and distribution work. They defined these categories in the following way:

Inputs: cash, personnel, equipment and other materials combined with mission and strategy.

Activities: Specific programmes of events and tasks.

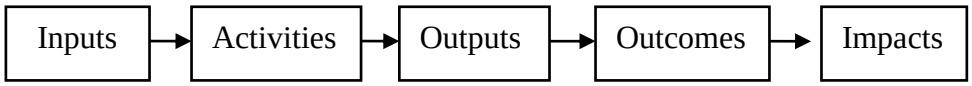
Outputs: Products and services resulting from activities.

Outcomes: Specific changes in behaviour and in individuals caused by the output.

Impacts: The benefits to the community, including members, as a result of the outcomes.

The basic structure of the input/output model is illustrated in Figure 2.1 below. The inputs are the resources that the association has available to it. The resources are employed in carrying out social programmes and organising events and tasks. These activities are designed to move the association towards the achievement of its goals. Each activity results in the creation of products or some form of community service which are the outputs of the activities. The outputs (products and community service) are expected to cause a beneficial change of some form which may be a change in individuals' behaviour or circumstances. These changes are referred to as outcomes. Finally, the outcomes have a positive impact on the community, including the members of the association, which is measured in terms of the benefits they have received.

Figure 2.1. The Basic Structure of the Input/output Performance Model.



The model is applied by measuring inputs (resources), activities carried out and the outputs of the activities. These dimensions are tracked over time to measure performance or comparisons are made with similar organisations if this information is available. Difficulties in applying the model emerge when outcomes and impacts need to be measured as these dimensions are often intangible and difficult to quantify. There is also a lag effect from the employment of resources to the impact on the community or members which needs to be identified and taken into account. These difficulties have limited the application of the model and raised concerns as to the validity of the results it produces (Herman & Renz 2006).

Sawhill and Williamson (2001) developed a similar model for measuring organisational performance that was based on three dimensions:

Impact: measure progress towards fulfilling the mission and achieving the organisation's goals and objectives.

Activities: measure the extent to which activities and programmes are achieving the objectives and implementing strategies.

Capacity: assess available resources to determine whether they are adequate to achieve the objectives.

Packard (2010) built a logic model based on a framework developed from a survey conducted to identify the factors affecting organisational performance. The model mapped an inputs/throughputs/outputs flow. Inputs identified included: client and staff characteristics, leadership, management competencies, resources and environmental factors. Throughputs were grouped into management factors and programme capacity. Outputs were assessed at different levels including programme outputs and management outputs.

Sowa, Selden and Sandfort (2004) built a multi-dimensional integrated model of non-profit organisational effectiveness (MIMNOE) which found that management and programme performance were the main factors contributing to NPA performance. The factors used in the model were management performance, which was broken down to the sub-categories of management capacity and management outcomes, and programme performance, which was broken down into programme capacity and programme outcomes. In another variation of the input/output theme, Herman (1990) identified four different kinds of performance measures: financial indicators, constituent factors which involved measuring stakeholder satisfaction levels, outcome indicators and reputational measures. Problems associated with input/output models emerged, principally the difficulty in measuring outputs, outcomes and impact but also how to provide for the delay that inevitably occurs between the input of resources and the impact on the community (Heiberg & Bruno-van Vijfeijken 2009).

Many researchers followed different approaches to the input/output type models which were based on identifying factors that were positively associated with organisational performance. Taysir and Taysir (2012) conducted an extensive search of the relevant literature and identified 26 factors that had been found to contribute to organisational performance. They found volunteers play a crucial role in NPA performance but financial performance is one of the most critical dimensions of performance. Other researchers support the view that sustainability is vital to the long term survival of an organisation (Forbes 1998, Harrison & Sexton 2004, Tucker 2010). Tucker (2012) found that while profitability is a necessary goal, a large profit may indicate that the organisation is not providing the services that those who supplied resources had a right to expect. Profit, he concluded, is important but should not be the dominant goal. Tucker (2012) also found that organisational performance will be affected by the environment in which the NPA operates which raises the need for an association to make provision for contingencies. The contingency approach to measuring performance also found that external or internal factors can have an effect on organisational performance and that these should be incorporated into any performance measurement model (Ostrower & Stone 2010).

Other studies have identified management processes as an important factor affecting organisational performance (Forbes 1998, Green & Griesinger 1996). Management processes include strategic planning, policies and procedures, financial control processes, dispute resolution, resource development and board development. In these multi-dimensional models the factors may not have an equal weight and weighting may vary from one type of NPA to another (Taysir & Taysir 2012).

In summary, assessing the performance of NPAs remains an important area for further research as the achievement of an organisation's goals is often difficult to quantify making objective comparisons between organisations equally difficult (Willems, Huybrechts, Jegers, Weijters, Vantibborgh, Didee & Pepermans 2012).The problem of measuring organisational performance caused by the intangible nature of non-profit sector work is frequently noted in the literature. As a result current approaches are often criticised but little is offered by way of an alternative (Greatbanks et al 2010).

What has emerged is that the measurement problem requires a multi-dimensional approach and developing a model framework is a useful tool to assist in the process of identifying the relevant factors (Moxham 2010, Mwenja & Lewis 2009, Sawhill & Williams 2001). There is support in the literature for the view that the focus should be on measuring achievement of the goals which lead the organisation towards the mission (Forbes 1998, Sawhill & Williamson 2001) but financial performance cannot be ignored (Taysir & Taysir 2012).

Despite the extensive research that has been conducted, the findings from past studies are generally inconclusive leading to a lack of consensus as to which model is the best approach (Herman 1990, Moxham 2010, Taysir & Taysir 2012). Lee and Brower (2006) describe the literature as being "characterised by controversy, confusion and ambiguity". Their review of the literature led them to conclude that NPAs are faced with narrowly designed models with an emphasis on performance and productivity at the expense of other dimensions. The Not-for-Profit Governance and Performance Study conducted by the Australian Institute of Directors (2014) found that boards want better performance indicators than those that are currently available. In particular, the need for information that measures their effectiveness in achieving their mission remains unsatisfied.

Baruch and Ramalho (2006) found that many studies treat the subject of organisational performance as if nothing relevant has been achieved in the past and claim this approach is detrimental to organisational science. Their extensive review of the literature led Baruch and Ramalho (2006) to conclude that future research into NPA performance should be based on the cumulative knowledge of what has occurred in the past.

A summary of past approaches to measuring association performance is provided in Section 2.5.

2.4 Measuring Management Deficiency

A thorough search of the literature found no references for research into measuring individual management deficiency in either the for-profit sector or the

non-profit sector. The search only found reference to reports of management deficiencies being responsible for major problems, even disasters, in a number of areas such as business failures (Risk Alert 2013), environmental programme management (Stabroek News 2007), mine management (Queensland Department of Employment, Economic Development and Innovation 2011, World Information Services on Energy 2014) and the management of public utilities (Management Deficiency Report: Public Building Service 2010).

At the overall board level, the main management deficiencies associated with NPA and business failures have been identified as: poor financial control, management skills not balanced across the executive team and a lack of management experience (Productivity Commission 2010, Risk Alert, 2013) but no evidence could be found in the literature of studies which attempted to measure management deficiencies. This review will examine the literature in the broader field, management performance. Variations in terminology encountered in the literature were summarised in Section 2.3, Table 2.1.

Following the same development path as non-profit organisational performance research, the initial approach to measuring management performance in the non-profit sector again drew on the techniques that were then applied to measuring performance in the for-profit sector. At first this approach appeared to be more successful than it was when applied to measuring overall organisational performance. According to Thach and Thompson (2007) this phenomenon is due to the similarity in the dimensions of leadership in the two sectors. They note that the findings from for-profit leadership research are often applied directly to management performance in the non-profit sector and claim that this situation is due to the substantial overlap in the key competencies required for good leadership in both sectors.

Despite this early optimism, researchers became increasingly concerned that the techniques used to measure management performance in the for-profit sector did not take into account the cultural differences that exist between for-profit and non-profit organisations and the effect these cultural differences have on measuring the performance of non-profit management teams. Cultural differences between for-profit and non-profit organisations were noted in Section 2.2 which reviewed the NPA literature.

There emerged a growing acknowledgement that measuring the performance of non-profit management teams is more difficult than measuring the performance of the association as a whole. A great deal of research has been conducted in this area but there is no consensus as to which approach is the best to use (Cornforth 2012, Ostrower & Stone 2010, Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Holland, Chait & Taylor 1989). What has emerged from this research is a better understanding of the factors that contribute to management performance.

The Contribution of Not-for-profit Organisations report (Productivity Commission 2010) cites a study by the Business Reconstruction & Insolvency firm BRI Ferrier which found that most NPA failures are the result of weak, inexperienced management. Nicholson, Newton and McGregor-Lowndes (2012) cited well documented instances of board failures affecting organisational performance. This type of finding has increased the focus on non-profit management performance with many research projects directed at measuring the relationship between the performance of the management committee and the

overall performance of the association (Brown 2005). There is no doubt that the management team plays an important role in ensuring the financial sustainability of the association and achieving the goals and objectives that will deliver its community purpose or mission. Alexander, Hearld and Mittler (2011) support this view and add that good leadership builds support for achieving the association's vision and goals, develops consensus and resolves disputes and conflicts. They also noted that management research is largely anecdotal and prescriptive leaving the fundamental nature and assessment of leadership unexplained. Nicholson, Newton and McGregor-Lowndes (2012) also found that the board can have a profound effect on organisational outcomes and well-being, claiming that there is increasing recognition of the positive role that a board can play to create value for the organisation that it governs. McDonagh (2006) also found a strong correlation between board performance and organisational performance.

Willems and others (2012) claimed that board management practices are better developed in organisations that are perceived to be higher performing. They note that the quality of management performance has become progressively more important in non-profit literature and claim this is due to the widely held view that proper management practices ensure better organisational performance.

In a review of the non-profit literature, Alexander, Hearld and Mittler (2011) found that past studies often show considerable variation in the number and type of management attributes measured, making it difficult to compare the results from different studies. The findings from their study, which identified ten leadership categories, may suggest that the members of an association place more emphasis on stability, transparency and conflict resolution than on management behaviours that are innovative and different.

Langabeer and Galeener (2007) found that high board involvement, participation and visibility are positively related to improved board performance. In particular, they note that a lack of board participation in the strategic decision making process is often related to board failures. Other research studies have identified strategic planning as a key performance factor. Higher performing boards were found to have a strong strategic focus. Tucker and Parker (2013) claim that the process of developing strategy is as important to an NPA as it is to for-profit organisations but the process is approached in a different, often informal, way. NPAs use some form of strategic planning to better understand their operating environment, identify and prioritise objectives, allocate scarce resources and develop programmes and activities (Brown & Iverson 2004). In their investigation into board responsibilities, Langabeer and Galeener (2007) found the main areas of responsibility to be the performance and sustainability of the organisation, adopting a system of performance measurement, succession planning and maintaining a focus on achieving the organisation's goals and objectives.

Nafukho (2009) identified knowledge as the most critical asset for survival and performance of an NPA. He highlighted the importance of intellectual capital to the organisation, which includes experience and knowledge, and identified years of service as a measure of knowledge and experience.

Willems and others (2012) developed a governance quality index using a quantitative approach. They identified five factors associated with good governance: external stakeholder involvement, consistent planning, structures and procedures, continuous improvement and leadership team dynamics. Interestingly,

they made one of the few references found in the literature to the need for future research to focus on management shortcomings, stating that such an approach would enable direct actions to be taken where most needed.

In an investigation into poorly performing boards, Salamon and Chinnock (2004) drew attention to the view expressed in the literature that ineffective boards are linked to weak organisational accountability. In their view, an important challenge facing boards is the appropriate diagnosis of their weaknesses saying that little has been done to ensure the reliable diagnosis of problems facing non-profit boards. Boards that measure the performance of their practices and processes in a meaningful way are in a better position to increase overall organisational performance (Overell 2011).

A study conducted by Nicholson, Newton and McGregor-Lowndes (2012) found that an appropriate skills mix within a board had a significant positive association with measures of both board and organisational performance. They developed a diagnostic tool for measuring management performance which focuses on the board as a team. They found that good governance relies on the behaviour of the people on the management team and good board performance includes individual phenomenon. They note the growing evidence that the performance of an organisation's governance system relies on the board operating well together as a team. In addition, boards need action orientated information to improve their performance. The main finding of this study was that a clear sense of agreed purpose founded in a clear understanding of board objectives was important to board performance.

Doherty and Hoye (2011) investigated role ambiguity amongst board members and in the course of that study they noted that assessment of individual board member performance has received little attention. They found that role ambiguity has a negative impact on management performance. When board members are not clear as to what their individual responsibilities are, there is confusion over who is responsible for what. There is also a risk that some areas of importance will be overlooked entirely or, at best, not given the proper attention they need (Widmer 1993, Wright & Millesen 2008). Role ambiguity is also associated with lower satisfaction in the role, lower levels of commitment and an increase in stress (Doherty et al 2011).

A contingency approach to measuring management performance found that external or internal factors can also have an effect on overall management performance and that these factors should be incorporated into any performance measurement model (Ostrower & Stone 2010). Internal factors are defined as certain organisational crises or major events. Examples of external factors are unfavourable changes to government legislation and changes in the external funding environment.

There is agreement in the literature that affective commitment has a significant, positive effect on board member performance (Doherty & Hoye 2011, Preston & Brown 2004). Affective commitment is associated with a sense of belonging so it involves such traits as attachment to, identification with and involvement with the organisation (Allen & Meyer 1996).

Brown (2007) identified board development as an important factor affecting board performance. He focussed on three elements of management team development:

recruitment, orientation and performance evaluation. The results of his study emphasised the need for board recruitment policy to be directed towards bringing competent and capable people onto the board. Such people bring skills, knowledge and experience into the team which leads to an improvement in board performance. He noted that NPAs face a challenge in achieving this outcome because of their voluntary nature but emphasised that knowledge, skills and experience are key competencies for board members. It has been established that a management team is most efficient if the experience, knowledge, skills and abilities are balanced across the team (Schjoedt & Kraus 2009).

The report produced by the Productivity Commission (2010) also highlights the problem that volunteer-only associations have in attracting the right people to their management committee. The report also noted that an equally difficult problem some committees have to deal with was getting the wrong people off the committee. Tenure systems inherent in the culture of an association can make it difficult to remove a long standing committee member who has considerable support amongst the membership even though their performance as a committee member is poor. The recruitment related findings increase the likelihood of management deficiencies being present, particularly in smaller NPA committees. Further, it is reasonable to assume that, if a committee is performing poorly then that is largely attributable to the competencies and personal attributes of the individual committee members (Balduck, Rossem & Buelens 2010).

Because of the direct relationship between board performance and organisational performance, strengthening board performance is widely recognised as being of major importance to the achievement of the organisation's goals and objectives (Jackson & Holland 1998, Kerr & Gade 1989). Board development practices lead to more competent boards, better overall board performance, better organisational performance and improved community service (Brown 2007). Brown (2007) also made the point that the competencies of individual board members have not been universally established and that the majority of NPA research into management performance has focussed on group level indicators of performance rather than individual board member performance indicators.

A detailed study of management team composition across all sectors carried out by Schjoedt and Kraus (2009) found that team composition has an effect on performance. They identified two significant team member characteristics: educational background and function or industry experience. However, the effect of these characteristics reduces over time as the team member becomes involved in problem solving and decision making, suggesting that direct experience in the role is more important than educational background or similar industry or functional experience. In the same study, Schjoedt and Kraus (2009) also examined the composition of boards using a heterogeneous/homogeneous approach. They found that a heterogeneous team composition improved performance at solving novel problems while a homogeneous team composition led to better performance in dealing with routine tasks. However, they found that heterogeneity leads to conflict which increases the time it takes to solve problems and make decisions. While constructive conflict can result in more comprehensive decisions based on richer information and different perspectives, destructive or affective conflict can take the form of personal attacks and internal politics which can lead to less productive performance (Schjoedt and Kraus 2009).

More recent research has identified teamwork as an important factor contributing to board performance. A study conducted by McDonagh (2006) claimed the most important factor contributing to board performance is collaborative board functioning. He found that high performing boards are distinguished by effective social systems which involve the social dynamics of board interaction combined with competency, integrity and the constructive involvement of individuals. Parker (2007) also established the importance of a cohesive team culture, characterised by a clear sense of mutual respect, considerable informality and good humour. He found that social networking amongst board members adds to board performance. He also found that the development of boardroom culture and processes can assist in building cohesion, loyalty and retention of skilled board members.

Thach and Thompson (2007) carried out a comparison of leadership competencies between the for-profit and non-profit sectors. They found that although many leadership competency models have been developed, they only provide a general description of the identified competencies and do not proceed to develop a performance measurement model which is based on the relationship between the competencies and management performance. That aside, the competency models reviewed consistently identified social/interpersonal skills, knowledge and experience as necessary competencies for sound leadership. Thach and Thompson's (2007) study led to the finding that the development of competencies is critical to management performance and the overall success of the organisation. They found the top three leadership competencies to be honesty and integrity, being collaborative and developing others.

Brown (2007) also noted that there is considerable support in the literature for using a multi-dimensional approach to measuring management performance as there is no single factor that can embrace the complex nature of non-profit committees and the individuals that comprise them. Adopting the same approach as that used for measuring organisational performance, the main focus of these multi-dimensional studies was to identify the factors that are associated with management performance. In most cases, data was collected from the chief executive officers of large NPAs using either personal interviews or self-administered questionnaires. A common technique was to ask the CEO to rate, in order of importance, the factors that are important for good management performance. Despite the development of many multi-dimensional models, no single technique has emerged as the preferred approach and there is no agreement as to which set of factors should be included in a model (Herman 1990, Lee and Brower 2006, Moxham 2010, Taysir & Taysir 2012). The findings from these studies are referred to as models but they do not present a technique for actually measuring performance (Thach and Thompson 2007). Techniques are not provided for quantifying the identified factors and the relationship between the factors and organisational performance is not established. As a result, assessing the performance of NPAs remains an area requiring further investigation (Lecy, Schmitz & Swedlund 2011, Willems, Huybrechts, Jegers, Weijters, Vantibborgh, Didee & Pepermans 2012).

A number of studies have contributed to the development of a research framework approach to identify the factors contributing to management performance. Using this approach Herman and Renz (1997) identified eleven roles and responsibilities of boards and Green and Griesinger (1996) identified nine key performance

factors. Further work was done in this area by Cornforth (2001) who identified five key functions of boards in addition to four board member inputs: time, which is related to commitment, skill, structure and processes, all of which contribute to board performance.

Jackson and Holland (1998) used six dimensions of board competency to develop their Board Self-Assessment Questionnaire (BSAQ). Their model produced a measure of overall board performance and was accepted as a useful measurement tool that can identify specific areas needing attention. The lack of focus on individual board member competencies limits the ability of the model to identify the source of problems that may have been detected at the overall board level. The questionnaire also consists entirely of agree/disagree response ratings which raises the distinct possibility of acquiescence response bias affecting the results yet there is no reference in their report to assessment of response bias error and its affect on the results produced by the model.

In summary, the literature on the subject of measuring management performance is extensive with many different approaches reported but there is now a measure of agreement that a multi-dimensional approach is required (Brown 2007, Cornforth 2001, Jackson & Holland 1998). Most research has involved developing a framework to identify the factors affecting overall committee performance which could be described as a macro level approach (Cornforth 2001, Green & Griesinger 1996, Herman & Renz 1997). The findings from these studies are referred to as models but they do not present a technique for quantifying the identified factors, establishing the relationship between them and actually measuring management performance (Thach and Thompson 2007). There is no agreement on the set of factors that should be used and the findings from one study sometimes do not support the findings of another study (Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Cornforth 2012, Holland, Chait & Taylor 1989, Ostrower & Stone 2010). There is generally a positivist orientation to the current approach to measuring management performance, looking at a range of matters a committee should be dealing with and how well they go about this task (Cornforth 2012). Rather than focus on the competencies and attributes needed to carry out their responsibilities, there tends to be a focus on the roles of committee members and how involved the individual committee members are in processes and activities (Preston & Brown 2004). These studies fail to provide any useful information on the strengths and weaknesses of individual committee members yet this is the actionable information that NPA management teams need to improve their performance (McDonagh 2006). However, there are some indications that researchers have started to become aware of the need to study management performance at the individual committee member level with a focus on individual contributions but to date no progress has been made in this area (Doherty & Hoye 2011).

2.5 Summary of Past Approaches

In this section a brief description of past approaches to measuring association and management performance is provided together with limitations that have been noted in the literature.

2.5.1 Financial Models

Description: Models used in the for-profit sector were applied directly to the non-profit sector. The models were based on financial measures of performance.

Limitations: The financial indicators used in the models are now considered to be inappropriate for application in the non-profit sector (Greatbanks, Elkin & Manville 2010, Moxham 2012, Taysir & Taysir 2012, Tucker & Parker 2013).

2.5.2 The Balanced Scorecard

(Kaplan 2001)

Description: The model is a modification of a technique used in the for-profit sector which measures progress over time towards achieving strategic objectives.

Limitations: The model needs to be tailored to each NPA. The financial components of the model are now considered to be inappropriate for NPAs. The measurement of outcomes of operational actions is overly complex and often involves subjective assessments which can produce unreliable results (Norreklit, Jacobsen & Mitchell 2008).

2.5.3 Uni-dimensional Models

Description: Models which identify one factor only, the measurement of which is claimed to provide a measurement of association performance. The factors identified by different researchers for use in these models include:

Sustainability (Forbes 1998, Harrison & Sexton 2004, Tucker 2012)

Contingency planning (Ostrower & Stone 2010)

Management processes (Forbes 1998, Green & Griesinger 1996)

Committee involvement and participation (Langabeer & Galeener 2007)

Strategic planning (Brown & Iverson 2004, Tucker & parker 2013)

Role clarity/role ambiguity (Doherty & Hoye 2011, Widmer 1993, Wright & Millesen 2008)

Internal assessment of management practices and processes (Overell 2011)

Commitment (Doherty & Hoye 2011, Preston & Brown 2004)

Committee development (Brown 2007)

Team composition (Schjoedt & Kraus 2009)

Teamwork (McDonagh 2006, Parker 2007)

Limitations: Some models are based on financial factors that are now considered to be inappropriate for NPAs but in general the models fail to take into account other important dimensions of performance (Baruch & Ramalho 2006, Herman & Renz 2002). In the literature they are described as narrowly based models (Lee & Brower 2006). There is no consensus as to which factor is the most important and the researchers do not provide a technique for measuring the identified factor.

2.5.4 Achievement of Objectives Models

Description: The models focus on measuring the achievement of the association's objectives (Epstein & McFarlan 2011).

Limitations: The objectives are often intangible and difficult to measure which can produce questionable results (Forbes 1998).

2.5.5 Input/output Models

(Bagnoli & Megali 2011, Herman 1990, Packard 2010, Sawhill & Williamson 2001, Sowa & Sandfort 2004)

Description: The models are applied by measuring inputs (resources), activities carried out and the outputs of the activities. These dimensions are tracked over time to measure performance.

Limitations: The models need to be tailored to each NPA. They are difficult to apply as the dimensions are often intangible and difficult to quantify. There is a lag effect from the employment of resources to the impact on the community or members which is difficult to identify and take into account (Heiberg & Bruno-von Vijfeijken 2009, Herman & Renz 2006).

2.5.6 Multi-dimensional Models

Description: There are many variations of this type of model documented in the literature. Two or more factors are identified as being important in determining management performance. The main factors identified and used in these models are management skills, management experience, knowledge, commitment and social skills.

Limitations: No consensus has been reached on which factors are important and should be included in the models. The models are criticised for the approach adopted by the researchers which is generally not based on the accumulated knowledge contained in the literature. It is claimed that the development of each model has been carried out as though nothing worthwhile has been done in this field in the past (Baruch & Ramalho 2006). The factors selected for inclusion in the models are not clearly defined. The models only provide a general description of the identified competencies and fail to provide techniques for quantifying them and identify the relationship between the factors and management performance (Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Chait & Taylor 1989, Cornforth 2012, Ostrower & Stone 2010).

2.6 Heuristic Modelling

2.6.1 Introduction to Heuristic Modelling

The word "heuristic" comes from the Greek word "heuriskein" meaning "to find or discover". It was first used in psychology where it is defined as a mental shortcut that allows people to solve problems and make judgements quickly and efficiently. In mathematics, heuristic refers to experienced based techniques for problem solving and learning that provide a solution to a problem that is not necessarily optimal (Wikipedia On-line Encyclopaedia 2014). As a mathematical technique for finding acceptable, approximate solutions to complex problems, heuristic models have been in use for over 30 years. For example, the heuristic methodology known as simulated annealing which is used in this study was documented by Kirkpatrick, Gelatt and Vecchi in 1983. A summary of the general types of heuristic methodologies, such as simulated annealing (Kirkpatrick, Gelatt & Vecchi 1983) and threshold accepting (Dueck & Scheuer 1990), can be found in Section 2.6.2.

The most common application of heuristic modelling is to find approximate solutions to optimisation problems that are too complex to solve by other means. Heuristic models are now used in many fields including engineering (Chung & Tanchoco 2008, Satoglu, Durmusaglu & Ertay 2006), networking (Zeng, Castillo & Hodgson 2010), distribution logistics (Dawande, Gavirneni & Tayur 2006), crew scheduling (Nanthavanij, Yaoyuenyong & Jeenanunta 2010), finance (Gilli & Schumann 2011) and the social sciences (Gerhard & Witt 2000). Some examples of the use of heuristic models are presented in Section 2.6.3.

The review of the literature relating to measuring association and management performance (Sections 2.3 and 2.4) found that no single solution technique has emerged that has gained wide acceptance. In this type of situation a heuristic approach can provide an acceptable, approximate solution when the search for a solution using traditional analytical methods has not been successful (Satoglu, Durmusaglu & Ertay 2010). A thorough search of the literature failed to find any report of a heuristic approach being used to solve a management or organisational performance measurement problem. Therefore this review will examine the application of heuristic modelling to problem solving in general and focus on basic heuristic modelling techniques and the basic heuristic model development process.

There is considerable support in the literature across a wide range of applications that a heuristic approach can be employed when the number of variables is large and the relationship between the variables is unknown (Gilli & Schumann 2012, Satoglu et al. 2010, Tempelmeier & Buschkuhl 2009). Even though the heuristic solution is an approximate one it may still be better than a poor solution derived from traditional analytical methods or having no solution at all when traditional methods cannot be applied (Gilli et al. 2012). The literature also indicates that there is considerable support for the use of heuristics as an efficient approach to the solution of complex problems even though a traditional analytical method is available (Chenz & Li 2008, Dawande, Gavirneni & Tayur 2006, Yang, Karaesmen & Keskinocak 2008, Zeng, Costello & Hodgson 2010). It has been found that an efficient and robust heuristic model can be used to find acceptable,

approximate solutions to large difficult problems within a reasonable amount of time when compared to traditional methods (Chenz & Li 2008, Dawande, Gavirneni & Tayur 2006, Yang, Karaesmen & Keskinocak 2008, Zeng, Costello & Hodgson 2010). By way of example, Chung and Tanchoco (2008) solved a standard double row layout problem by a traditional, analytical technique known as mixed integer programming then developed a heuristic model to solve the problem. They found that the heuristic model produced reasonably good solutions with shorter computation times which would allow engineers to test more alternative scenarios. In this context, a good solution is one that produced a layout that is operationally efficient.

Having identified and clearly defined a problem, the development of a heuristic model requires that possible solution techniques are explored and a search is undertaken of knowledge relevant to the problem. Different solution methods are then tried to see if they produce feasible results. In this context, a feasible solution lies within the range of possible outcomes and is not an extreme solution. The researcher learns from the results and refines the model. A proposed heuristic model may need to be tested a number of times before an acceptable, approximate solution is obtained (Satoglu et al. 2010).

Dawande, Gavirneni and Tayur (2006) demonstrated the effectiveness of this process which they summarised as:

1. Obtain an initial solution.
2. Refine the model to obtain a better solution.

This process continues until a better solution cannot be found. Dawande, Gavirneni and Tayur (2006) suggest the use of a pilot study to test the ability of the model to solve the problem. This heuristic model development process is sometimes referred to as an improvement-based process (Chung & Tanchoco 2010). Gilli and Schumann (2012) also support the heuristic model development process outlined above and state the need to validate the obtained solution to verify that:

1. A feasible, meaningful solution has been derived from the model.
2. The model produces reliable and reasonably accurate results.

2.6.2 General Heuristic Modelling Methods

(Gilli & Schumann 2011, Kokash, N. 2013)

In this section a brief description is provided of some general heuristic modelling methods.

2.6.2.1 Simulated Annealing

(Kirkpatrick, Gelatt & Vecchi 1983)

From an initial solution, small refinements to the model produce new solutions which are plotted to determine the direction in which they are heading. If the new solution is better than the previous one it is accepted and the process continues until the model reaches an optimal state. If a new solution is worse, it is not immediately rejected as a local maximum or minimum may have been

encountered. The process usually continues according to a predetermined number of iterations.

2.6.2.2 Threshold Accepting

(Dueck & Scheuer 1990)

Threshold Accepting models are similar to Simulated Annealing models but they accept deteriorations in the solution unless they are greater than some pre-determined threshold.

2.6.2.3 Tabu Search

The strategy of Tabu Search methodology overcomes the problem of encountering a local minimum which is common in optimisation problems. These models keep a memory of recently found solutions which are forbidden (Tabu) as long as they stay in the model's memory. Through this process the model will move on from a local minimum as it is temporarily not allowed to revisit this solution.

2.6.2.4 Population Based Models

Population based models avoid the problem of local minima by maintaining a number of solutions at a time, some of which are worse than others, rather than just one solution.

2.6.2.5 Genetic Algorithms

Genetic Algorithms have their origin in evolutionary biology. The process starts with a whole population of solutions. As solutions are tested only the best solutions are retained (survival of the fittest) in the population.

2.6.2.6 Particle Swarm

This technique is based on the behaviour of a flock of feeding birds. The population of possible solutions are stored as vectors. With each iteration a solution is updated by adding another vector. The technique maps the direction towards the best solution.

2.6.2.7 Ant Colony Optimisation

This technique uses artificial "ants" to build solutions by moving on the problem graph and changing it in such a way that future "ants" can build better solutions. It is used for problems where a best solution can be represented as a point on a surface.

2.6.2.8 Other Techniques

Harmony Search, Big Bang and Big Crunch, Charged System Search and Support Vector Machines are some other types of general heuristic methodologies.

2.6.3 Examples of the Application of Heuristic Modelling

In this section some brief examples are provided of problems that were solved by developing a heuristic model.

Example 1: A heuristic model for a hybrid cellular manufacturing system to facilitate a one-piece flow production practice (Satoglu, Durmusaglu & Ertay 2010).

Example 2: A heuristic model to optimise financial asset portfolios with alternative risk measures (Gilli & Schumann 2011).

Example 3: A heuristic model to investigate the network flow structure for a real-world transportation system and to develop a method of aggregating data for the standard flow-intercepting location model (Zeng, Castillo & Hodgson 2010).

Example 4: A heuristic model to optimise shipping products to multiple customers from limited inventory (Dawande, Gavirneni & Tayur 2006).

Example 5: A heuristic workforce scheduling model with combined safety and productivity objectives (Nanthavanij, Yaoyuenyong & Jeenanunta 2010).

Example 6: A general quantity discount and supplier selection heuristic model involving several products ordered simultaneously that can be ordered from several suppliers. (Stadtler 2006).

Example 7: A heuristic model to study the joint decisions of subcontracting and detailed job scheduling which will minimise total production and subcontracting costs subject to a constraint on the maximum completion time (Chen & Li 2008).

Example 8: A heuristic model for a single product, three level warehouse distribution system supporting multiple retail outlets (Huq, Jones & Lafontaine 2011).

Example 9: A heuristic model for manufacturing cell formation problems with consideration of multiple production factors such as production volume, batch size and alternative process routings (Liu, Yin, Yasuda & Lian 2008).

Example 10: A heuristic systematic model of information processing, developed for US Homeland Security application, to investigate whether the relationship between different safe context factors and a security professional's perceptions of collaboration success will be contingent upon the difference in the geographical proximity of the collaborating parties (Malchrzak & Javenpaa 2010).

Example 11: A traditional double row layout problem that deals with how to place departments or machines on both sides of a central corridor was solved using traditional analytical techniques. A heuristic model developed to solve the same problem produced reasonably good solutions with shorter computation times for problems involving up to 10 machines. Using the heuristic model allowed engineers to evaluate more alternative scenarios interactively (Chung & Tanchoco 2008).

Example 12: A heuristic model to investigate an atomic/molecular spectroscopy analogy for the segmentation of market demand (Johnson, Imam & Askor 2011).

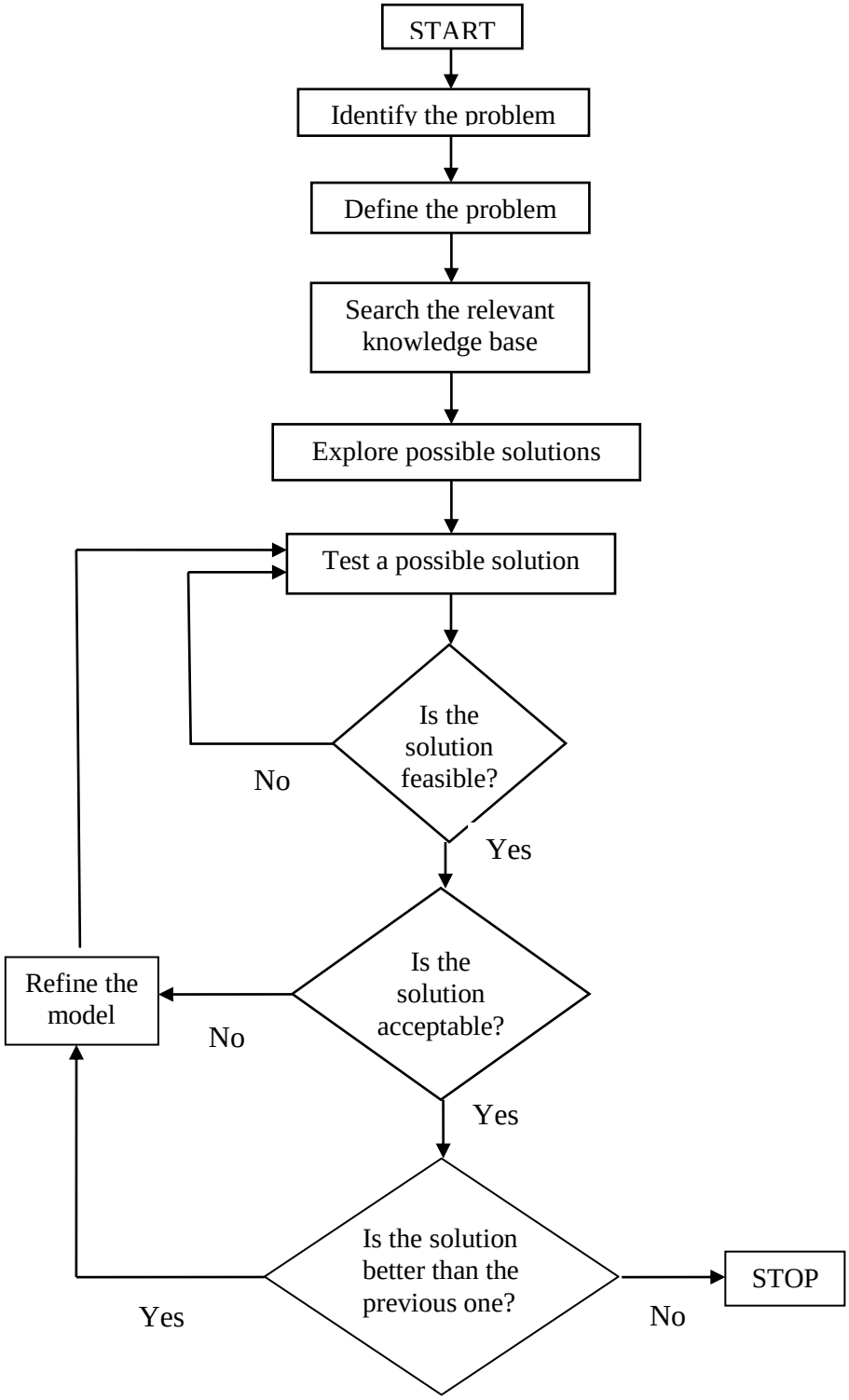
Example 13: A heuristic model to provide diagnostic capabilities and prevention insight for the prevention of injury in an industrial environment (Blanco, Gillingham & Lewko 2006).

2.6.4 Summary of Heuristic Modelling

In a situation where an analytical solution to a problem is overly complex, unrealistically time consuming in computational terms or where no solution can be found by traditional methods, a heuristic approach can provide an acceptable, approximate solution (Gilli & Schumann 2012, Satoglu et al. 2010, Tempelmeier & Buschkuhl 2009).

A high level description of the heuristic model development process presented in this section is illustrated by the flow chart shown in Figure 2.2. It shows that the process requires an exhaustive search through the problem space which contains the possible solutions to the problem. Out of these solutions the most promising one can be identified as an acceptable solution to the problem.

Figure 2.2. Development Process Flow Chart for Heuristic Modelling.



2.7 Summary of Main Findings from the Literature Review

The significant size and growing importance of the non-profit sector was established in Section 2.2 (Productivity Commission 2010). Calls for greater management accountability (Greatbanks, Elkin & Manville 2010) have created the need for reliable information to be available to NPA management teams to enable them to measure their own performance as well as the performance of the association towards achieving its goals and objectives (Nonprofit Finance Fund 2014; Nicholson et al 2012). Relevant information will also be critical in assisting NPA management in the gradual transition towards becoming more aligned with for-profit management practices and organisational structure (McDonagh 2006).

The current approach to measuring the performance of NPAs has received a great deal of criticism in the literature. Research findings are generally inconclusive leading to a lack of consensus as to the best approach to adopt (Herman 1990, Moxham 2010, Taysir & Taysir 2012). Following a review of the literature, Lee and Brower (2006) described the literature as being "characterised by controversy, confusion and ambiguity". Many articles treat the subject of organisational performance as if nothing relevant has been achieved in the past, a situation which is detrimental to organisational science. Further research should be based on the cumulative knowledge of what has occurred in the past (Baruch & Ramalho 2006).

Similar shortcomings are evident in the literature dealing with measuring management performance. Despite the building of many models, there is no agreement on the set of factors that should be used nor is there agreement that one model is better than another. (Cornforth 2012, Ostrower & Stone 2010, Barnard & Lesirge 2012, Bhardwaj & Vuyyuri 2005, Holland, Chait & Taylor 1989). The findings from these studies are referred to as models but they do not present a technique for quantifying the identified factors, establishing the relationship between them and actually measuring management performance (Thach and Thompson 2007). There is generally a positivist orientation to the current approach to measuring management performance, looking at a range of matters a committee should be dealing with and how well they go about this task (Cornforth 2012). There is a lack of focus on the competencies and attributes individual committee members need to carry out their responsibilities (Doherty & Hoye 2011).

Despite these shortcomings, a measure of consensus has emerged in the general approach to the management performance measurement problem. There is broad agreement that a multi-dimensional approach is preferable as no single factor can adequately define management performance (Baruch & Ramalho 2006, Bagnoli & Megali 2011, Forbes 1998, Herman 1990, Sowa, Selden & Sandfort 2004, Taysir & Taysir 2012). There is also support for using a research or model framework designed to help identify the important factors affecting performance (Brown 2007, Cornforth 2001, Jackson & Holland 1998).

In Section 2.6 the review of the literature was found to support the view that where a problem is complex and no traditional analytical technique can produce a

solution, a heuristic approach may provide an acceptable, approximate solution (Gilli & Schumann 2012, Satoglu et al. 2010, Tempelmeier & Buschkuhl 2009). Table 2.2 presents an analysis of the main findings from the review of the literature which aligns related characteristics from measuring association performance, measuring management deficiency and heuristic modelling.

Table 2.2. Summary of Main Findings from the Review of the Literature.

Measuring Association Performance	**Measuring Management Deficiency**	**Heuristic Modelling**
A complex, multidimensional measurement problem	A complex, multidimensional measurement problem	A technique for solving complex, multi-dimensional problems
No consensus on the best approach to adopt	No consensus on the best approach to adopt	An established mathematical process which has been successfully applied to a wide variety of problems
No universally acceptable solution technique using traditional, analytical methods has been found	No universally acceptable solution technique using traditional, analytical methods has been found	Can provide an acceptable, approximate solution when traditional, analytical techniques fail

This analysis presents a clear case for the adoption of a heuristic methodology to measure management deficiency which forms the basis of this research project.

2.8 Conclusion

The review of the literature laid the foundation for this project in two key areas:

1. A multi-dimensional/research framework approach was used to identify the factors associated with management deficiency (Brown 2007, Cornforth 2001, Green & Griesinger 1996, Herman & Renz 1997).
2. The traditional heuristic modelling process known as simulated annealing which was presented in Section 2.6.2 was the methodology adopted to build a model to measure management deficiency (Kirkpatrick, Gelatt & Vecchi 1983).

Chapter 3 documents the application of the multi-dimensional/research framework approach to identify the factors associated with management deficiency. The chapter also outlines how techniques to quantify the factors were developed and how a data collection instrument was designed.

Chapter 3. Identifying and Quantifying the Factors

3.1 Introduction

The review of the literature presented in Chapter 2 found that there is now agreement that non-profit management performance measurement is a multi-dimensional, complex problem (Baruch & Ramalho 2006, Bagnoli & Megali 2011, Forbes 1998, Herman 1990, Sowa, Selden & Sandfort 2004, Taysir & Taysir 2012). The findings reported from past studies that identified factors associated with management performance are referred to as models but they do not present a technique for quantifying the identified factors, establishing the relationship between them and actually measuring management performance (Thach and Thompson 2007). Traditional analytical techniques have failed to provide a measurement technique that is widely accepted as the best approach. The literature also supports the view that a heuristic modelling approach can produce an acceptable, approximate solution to a complex problem when traditional methods have failed to find a solution (Gilli & Schumann 2012, Satoglu et al. 2010, Tempelmeier & Buschkuhl 2009). Chapters 1 and 2 also presented an argument, based on findings from the literature that the focus of this research project should be on measuring management deficiency.

Drawing on the accumulated knowledge contained in the literature in general and the points presented above in particular, Chapter 3 defines the approach adopted for this study. After establishing the main responsibilities of a management committee, a model framework was built to identify the individual competencies and personal attributes necessary to carry out those responsibilities. Techniques for quantifying the identified competencies and personal attributes were developed, options for a data collection instrument were assessed and a preferred option selected. Finally, issues relating to the design of the data collection instrument were addressed.

3.2 Defining the Adopted Approach

The findings from the literature support the view that there is a direct relationship between management committee performance and the overall performance of the association (Alexander et al 2011, McDonagh 2006, Nicholson et al 2012). It follows that poor management committee performance will result in poor performance for the association. Further, it is reasonable to assume that, if a committee is performing poorly then that is largely attributable to the competencies and personal attributes of the individual committee members (Balduck, Rossem & Buelens 2010). Therefore the focus of this research project is on the individual competencies and personal attributes of committee members rather than focus on group level indicators as researchers have done in the past. This approach required the competencies and personal attributes a committee member should possess to carry out their responsibilities to be identified.

Chapter 3. Identifying and Quantifying the Factors

The Contribution of Not-for-Profit Organisations report (Productivity Commission 2010) cites a study by the Business Reconstruction and Insolvency firm BRI Ferrier which found that most NPA failures are the result of weak, inexperienced management. In other words, management deficiencies are the primary cause of NPA failures. In Chapter 1, Section 1.3.1 clear evidence was presented to support a focus on measuring management deficiency for this study. It was established that an assessment of individual management deficiencies would provide a management team with actionable information that would assist them to design a management development programme to improve their performance.

There is also substantial agreement in the literature that, as no single variable can adequately measure management performance, a multi-dimensional approach is required (Brown 2007, Cornforth 2001, Jackson & Holland 1998, Moxham 2010Willems et al 2012) and that developing a model framework is a useful tool for identifying the factors that are associated with management performance (Cornforth 2001, Green & Griesinger 1996, Herman & Renz 1997, Moxham 2010).

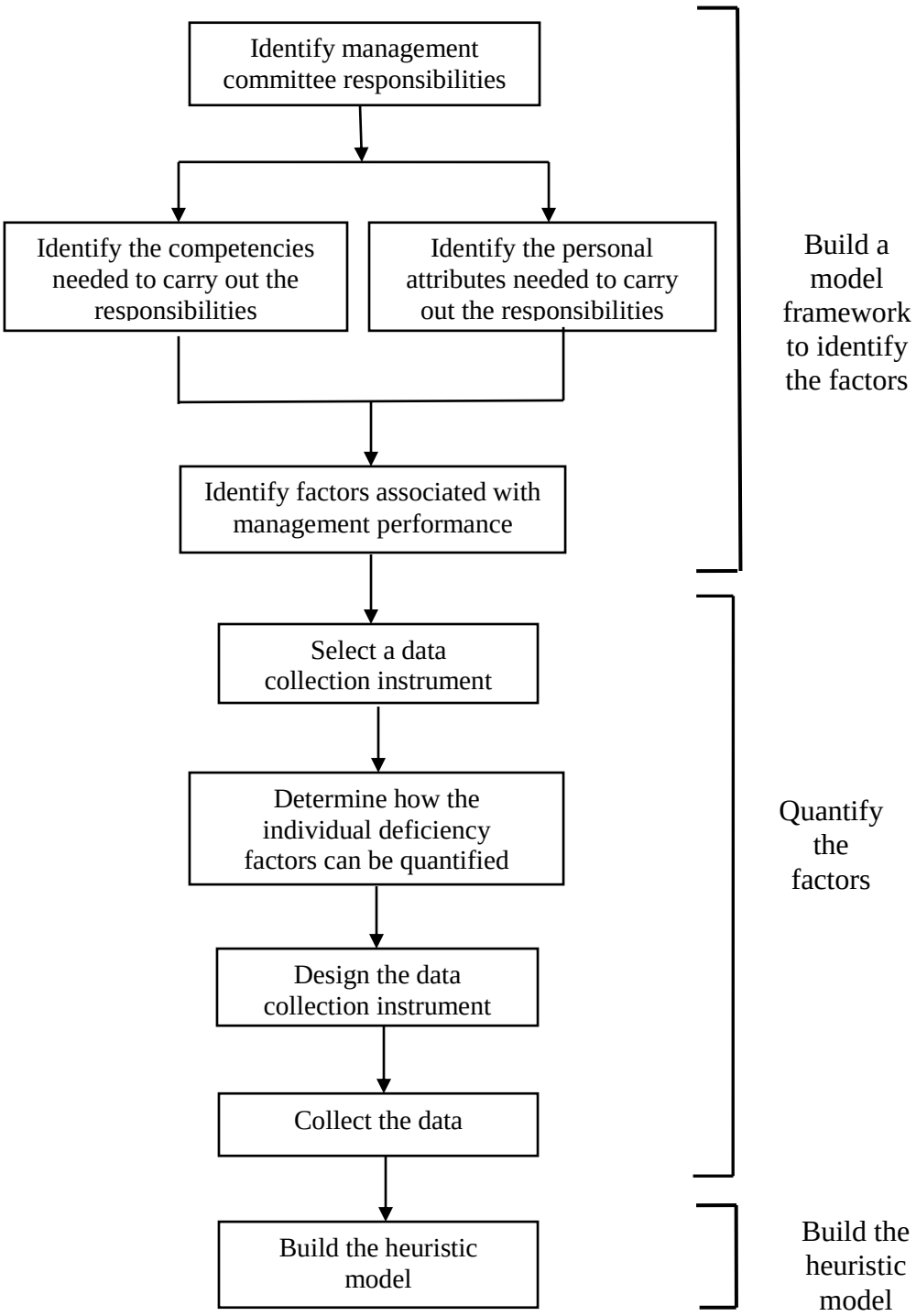
In Chapter 2, the review of the literature established that in a situation where a problem involves a large number of variables and is overly complex, or where no solution can be found at all by traditional methods, a heuristic approach can provide an acceptable, approximate solution (Satoglu et al 2010). No single, analytical solution technique has emerged as the best approach for measuring NPA management performance (Cornforth 2012, Moxham 2010). Therefore, it was a logical conclusion to adopt a heuristic approach for this study.

Using the findings from the literature as a foundation, the approach adopted for measuring individual management deficiency is defined as:

1. Identify the individual competencies and personal attributes (collectively referred to as factors) a committee member should possess to carry out their main responsibilities.
2. Quantify the factors associated with management performance.
3. Build a heuristic model that establishes a relationship between the factors and produces an acceptable, approximate solution to the measurement of individual management deficiency.

The adopted approach is illustrated in Figure 3.1, below. This chapter follows the adopted approach up to the design and testing of the data collection instrument. Chapter 4 follows the remainder of the adopted approach with the development of the initial form of the heuristic model.

Figure 3.1. Illustration of the Adopted Approach.



3.3 Building the Heuristic Model Framework

3.3.1 Identify Management Committee Responsibilities

The first step towards building the model framework was to identify the main responsibilities of the management committee. The knowledge and experience gained from seven years service on the management committee of an NPA combined with the knowledge gained from the review of the literature led to the identification of seven main responsibilities of a management committee which are listed below:

1. Achieve the objectives set out in the mission statement. (Alexander, Hearld & Mittler 2011, Bagnoli & Megali 2011, Epstein & McFarlan 2011, Forbes 1998, Herman & Renz 2002, Mwenja & Lewis 2009, Sawhill & Williamson 2001)
2. Meet legal obligations (Productivity Commission 2010).
3. Oversee financial control (Epstein & McFarlan 2011, Forbes 1998, Green & Griesinger 1996, Harrison & Sexton 2004, Langabeer & Galeener 2007, Productivity Commission 2010, Taysir & Taysir 2012, Tucker 2010).
4. Oversee asset management.
5. Income generation (Forbes 1998, Harrison & Sexton 2004, Productivity Commission 2010, Tucker 2010, Tucker & Parker 2013)
6. Communication (Bhardwaj & Vuyyuri 2005, Doherty & Hoye 2011, Widmer 1993)
7. Strategic planning (Bhardwaj & Vuyyuri 2005, Brown 2005, Brown & Iverson 2004, Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Jackson & Holland 1998, Langabeer & Galeener 2007, Tucker & Parker 2013, Willems et al 2012)

Each of the responsibilities presented above are defined in the following sections.

3.3.1.1 Achieve the Mission Statement Objectives

It was established earlier that each NPA would have been formed initially to provide some type of community service even if this was as simple as providing a focal point for a small group of hobbyists. The community service the NPA provides forms the basis of the association's mission statement upon which the objectives are based. The reason the association exists is to fulfil its mission and achieve its objectives. Achieving the objectives becomes the main responsibility of the management committee. Typically, the objectives are achieved through the activities and events performed and organised by the association.

3.3.1.2 Meet Legal Obligations

State Governments place legal requirements on incorporated associations and on committee members. In Queensland, NPAs must be incorporated in order to access government funding for projects that meet the Government's funding guidelines. In return, the association is required to follow the model rules that are laid down in the Incorporated Associations Act. The model rules form the bulk of

each association's constitution, the remainder being referred to as by-laws which contain the mission statement and other points that are either related to the association's field of interest or not specified in the model rules.

The main areas addressed by the model rules are:

1. Brief, and by no means comprehensive, role descriptions for the president, secretary and treasurer.
2. Financial reporting requirements which are based on an audited set of accounts.
3. Membership.
4. Meetings.
5. Management committee structure.

They also contain the processes for setting up an incorporated association and for winding up the association's incorporation. If an association does not follow the model rules or fails to meet the reporting requirements, its incorporation will be terminated. Therefore committee members should be aware of the association's legal requirements under the act and take an interest in ensuring that the requirements of the act are being met. In addition, committee members are held accountable for the management of their association's financial affairs. Therefore committee members should be aware of their individual legal responsibilities.

3.3.1.3 Oversee Financial Control

Sound financial management based on having good accounting practices and financial reporting in place is vital for providing board members with the information they need to manage the financial affairs of the organisation. Failure to ensure that accounting policies and procedures are being followed leaves the association vulnerable to fraud. Besides the treasurer, who should have a detailed knowledge of the association's accounting policies and procedures, committee members need to have a basic understanding of the financial processes that are in place and be able to understand the financial reports that are distributed at meetings.

3.3.1.4 Oversee Asset Management

The management committee is responsible for the management of the association's assets. Many smaller NPAs have few assets to manage as the association does not own the premises or facility it uses. In this case assets normally comprise some items of furniture and small appliances, office equipment and supplies and equipment related to the field of interest in which the association operates. For associations which own property the task of asset management is much greater and there are substantial additional costs involved. Besides the buildings themselves which will probably be the association's major physical assets, the asset register will contain many more items and in greater quantities. The task of asset management mainly involves servicing of equipment, repair/replacement of broken or old items, inventory control and preventing theft or misuse. Sound asset management practices should include a replacement programme for items when they reach a certain age. The association may also

have financial assets to manage such as term deposits, and for art societies there may also be an art collection that has been accumulated over time.

3.3.1.5 Income Generation

If the association is not generating enough income to meet its operating expenses then it will run at a loss and if this situation continues it will fail. Committee members are responsible for monitoring and nurturing the organisation's main sources of revenue while searching for ways to expand the revenue base. The monitoring role should include an analysis of year-to-date profit/loss by revenue account and whether these measures are in line with the committee's expectation or not. Committee members should also participate in the process of finding new sources of income.

3.3.1.6 Communication

Members of the association need to be informed of the roles performed and the individual responsibilities held by the different committee members and other office bearers. Put more simply, they need to be aware of who is responsible for what. Failure to do this leads to confusion, with members unsure who they should seek out in regard to a particular matter. To provide this information the individual roles and responsibilities of committee members and other office bearers need to be clearly defined, documented and communicated to members (Bhardwaj & Vuyyuri 2005). A lack of role clarity can also lead to conflict and confusion amongst committee members with a subsequent adverse affect on overall performance (Widmer 1993).

Policies and procedures should also be documented and made available to committee members and the general membership as too should a copy of the constitution. Making these documents available creates awareness of the processes followed by the association and its committee and builds an understanding of how things are done. New policies and procedures and any changes to existing policies and procedures should be communicated to all individuals who may be affected by the change.

The management committee is responsible for ensuring that the proper vehicles are in place for effective communication. Communication vehicles commonly used are production and distribution or circulation of documents, announcements at general meetings, notices placed on a notice board, articles or notices in the association's newsletter and direct contact with interested parties.

3.3.1.7 Strategic Planning

There is a widely held view in the literature that having a strategic plan in place is a major factor contributing to good organisational performance for non-profit organisations (Brown 2005, Green & Griesinger 1996, Jackson & Holland 1998, Bhardwaj & Vuyyuri 2005). It has been noted that a lack of board participation in the strategic decision making process is often related to board failures. Studies have identified strategic planning as a key committee performance factor with

higher performing committees found to have a strong strategic focus. Although it is common for an NPA not to have a formal strategic planning process in place, NPAs have been found to at least use some informal form of long term planning to better understand their operating environment, identify and prioritise objectives, allocate scarce resources and develop programmes and activities (Brown & Iverson 2004). Therefore members of the committee should have the necessary competencies to set out some form of long term direction for the association.

The normal strategic planning process would require the committee to reach a consensus as to the current state of affairs in each of the key areas to be incorporated into the plan. Examples of key areas could be membership, financial position, facility used, introduction of new technology or approaches to carrying out regular tasks and management structure. There needs to be agreement as to whether the current direction is acceptable and likely to lead to an improvement or whether the situation is unacceptable and a change in direction is required. It follows that committee members who lack analytical skills are likely to find it difficult to become involved in the strategic planning process.

3.3.2 Identifying Individual Deficiency Factors

For this project factors were defined as the individual competencies (Brown 2007, Nicholson, Newton & McGregor-Lowndes 2012, Schjoedt & Kraus 2009, Thach & Thompson 2007) and personal attributes (Allen & Meyer 1996, Doherty & Hoye 2011, Preston & Brown 2004, Glisky 2007, Taysir & Taysir 2012) needed to carry out the main responsibilities of a committee member. Having identified seven main areas of responsibility for the management committee, the next step in building the model framework was to identify the competencies and personal attributes required by the individual committee members to carry out those responsibilities. The knowledge gained from the literature and the knowledge and experience gained from serving on a management committee for seven years, which included direct involvement in key management roles, was the basis upon which the factors were identified.

Three main competencies were identified: skills, experience and knowledge. In addition to these competencies three personal attributes were identified: commitment, age and resistance to change. Each factor was then broken down into more specific elements and, where appropriate, sub-elements. Support for including the identified factors, elements and sub-elements is provided in Section 3.5. The six factors and their associated elements and sub-elements form the model framework. This framework is presented in Table 3.1 below.

Table 3.1. The Model Framework

Competencies	**Elements**	**Sub-Elements**
Skills	Analytical skills	Financial analysis
		Problem solving/ decision making
		Strategic planning
	Asset management	
	Administration skills	
	Organisational skills	
	Communication skills	
	Social skills	
	Political skills	
Experience	Management experience:	On this or another association's committee
		With a for-profit organisation
	Involvement in activities	
Knowledge	Association's objectives	
	Policies and procedures	
	Individual responsibilities	
	Legal obligations	
Personal Attributes		
Commitment		
Age		
Resistance to change		

3.4 Defining the Factors, Elements and Sub-elements

The individual competencies and personal attributes needed to carry out the responsibilities of a committee member are collectively referred to as factors. A description of each factor, together with references to support their inclusion, is provided in the following sections.

3.4.1 Skills

More studies identified a positive relationship between management skills and management performance than any other factor (Forbes 1998, Green & Griesinger 1996, Langabeer & Galeener 2007, Nicholson et al 2012, Tucker & Parker 2013, Willems et al 2012). A committee member's performance in a role cannot be satisfactory if they lack the skills needed to carry out the basic functions of the role (Brown 2007, Nicholson et al 2013, Schjoedt & Kraus 2009, Thach & Thompson 2007). The review of the literature and the knowledge and experience gained from seven years service on a management committee identified seven elements for skills that are important competencies for a committee member:

1. Analytical skills
2. Asset management skills
3. Administration skills
4. Organisational skills
5. Communication skills
6. Social skills
7. Political skills

Some of the elements were broken down further into sub-elements. These elements and sub-elements are displayed in Table 3.1. The skills elements and sub-elements are described in the following sections.

3.4.1.1 Analytical Skills

a) Financial Skills

There is a great deal of reference in the literature to the critical importance of financial control and the related areas of sustainability and the financial viability of the association. (Bhardwaj & Vuyyuri 2005, Brown 2005, Brown & Iverson 2004, Forbes 1998, Green & Griesinger 1996, Jackson & Holland 1998, Langabeer & Galeener 2007). Committee members need to have the competency to be aware of and monitor the key financial performance measures for their association.

b) Strategic Planning

Many researchers have identified strategic planning and the committee's involvement in the planning process to be a critical success factor for an NPA. (Forbes 1998, Green & Griesinger 1996, Harrison & Sexton 2004, Langabeer & Galeener 2007, Taysir & Taysir 2012, Tucker 2010, Tucker & Parker 2013, Willems et al 2012).

c) Problem Solving/Decision Making

Although there are a number of articles which investigate how decisions are made in specific areas of NPA management and fields of operation (Markham, Johnson & Bonjean 1998), no reference to studies which investigated the association between problem solving/decision making and management performance could be found in the literature. Mitrofanova (2005) claimed an effective decision making committee can strengthen a non-profit organisation in many different ways but did not support this with any research or references. In contrast, the subject of management decision making in the for-profit sector has been widely researched and the decision making process is an important academic field of study. Akrani (2013) claimed that organisations operate through the process of people making decisions and solving problems. He also found that decision making and problem solving are primary functions of management, stating that they pervade all management actions and are an indispensible component of the management process. The review of the relevant for-profit literature provides sufficient support for including decision making/problem solving as a factor in this study.

3.4.1.2 Administration Skills

There is a considerable amount of reference in the literature to the importance of sound management practices to overall committee performance (Brown 2007, Cornforth 2001, Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Willems et al 2012). Specific mention is given to having policies and procedure documented and followed, a comprehensive induction or orientation programme for new committee members and role descriptions documented and distributed to committee members. These practices fall into the area of administration skills and they are a collective responsibility of committee members.

3.4.1.3 Social Skills

Recent research has identified social skills as an important factor contributing to committee performance (Alexander et al 2011, Cornforth 2001, McDonagh 2006, Nicholson et al 2012, Parker 2007, Schjoedt & Kraus 2009, Thach & Thompson 2007). Good social skills are required to develop a sense of cohesion (Thach & Thompson 2007) and collaborative committee functioning (McDonagh 2006) which have been found to be positively associated with management performance.

3.4.1.4 Organisational Skills

Achieving the association's objectives contained in the mission statement is one of the main responsibilities of the management committee (Bagnoli & Megali 2011, Epstein & McFarlan 2011, Forbes 1998, Sawhill & Williamson 2001). The events and activities that the association organises lead the association towards the achievement of its objectives. Therefore, it is vital that a management committee contain people who have the necessary organisational skills to manage these events and activities.

3.4.1.5 Communication Skills and Political Skills

Willems and others (2012) found that developing good relationships with stakeholders was an important factor. The main stakeholders are the members of the association, the sponsors and members of the local council and State Government with whom the association has contact. Developing good relationships with these stakeholders involves both political skills and communication skills.

3.4.1.6 Asset Management Skills

No specific reference to the relationship between asset management skills and management performance could be found in the non-profit literature and yet the committee is responsible for the management of the association's assets. The detailed assessment of the committee's responsibilities in this area that was provided in Section 3.3.1.4 lead to the conclusion that asset management skills should be included as a factor.

3.4.2 Experience

Experience is considered to be an intellectual asset for an organisation with experienced committee members making a valuable contribution to overall committee performance (Brown 2007, Nafukho 2009, Schjoedt & Kraus 2009, Thach & Thompson 2007). For a committee member, management experience may be gained from time spent serving on the committee, time spent serving on the committee of another NPA or time spent in a relevant management role in a for-profit organisation. Organising, or being directly involved in, the association's events and activities is also important experience for a committee member (Langabeer & Galeener 2007).

3.4.2.1 Management Experience

In a study investigating the importance of intellectual capital to an NPA, Nafukho (2009) found that experience gained through years of service in a committee role had a positive association with management performance. This view is supported by Schjoedt and Kraus (2009) who found that educational background or time spent performing a similar function in a for-profit organisation provided useful experience but time spent in the current committee role is more important. They claim that the initial benefit derived from educational background and for-profit management experience diminishes as experience in the current role increases.

3.4.2.2 Involvement in Activities

Langabeer & Galeener (2007) found that a high level of involvement and participation by committee members in the association's events and activities is positively related to improved committee performance which makes the experience gained from this involvement an important competency for committee members.

3.4.3 Knowledge

Relevant knowledge is also considered to be an intellectual asset for an organisation (Brown 2007, Nafukho 2009, Schjoedt & Kraus 2009, Thach & Thompson 2007). In this context the knowledge referred to is knowledge of the association's culture, norms and values as well as the processes, policies and procedures that provide effective management control of, and guidance for the organisation. Following this definition, four elements were identified for the knowledge factor. They are knowledge of:

1. The association's objectives.
2. The individual responsibilities of committee members.
3. Policies and procedures.
4. Legal obligations.

A description of the knowledge elements is provided below.

3.4.3.1 Knowledge of the Association's Objectives

There is overwhelming support in the literature for achievement of the association's objectives to be the most important responsibility of the management committee and for committee members to have a clear understanding of these objectives (Bagnoli & Megali 2011, Epstein & McFarlan 2011, Forbes 1998, Herman & Renz 2002, Nicholson et al 2012, Sawhill & Williamson 2001). Therefore, knowledge of the association's objectives was included as an element of knowledge.

3.4.3.2 Knowledge of Individual Responsibilities

Several studies have identified role clarity or role ambiguity, which are directly related to knowledge of individual roles and responsibilities, as having an important impact on management performance (Doherty 2011, Doherty & Hoye 2011, Herman & Renz 2002, Widmer 1993, Wright & Millesen 2008). Therefore, knowledge of individual responsibilities was included as an element of knowledge.

3.4.3.3 Knowledge of Policies and Procedures

There are several references in the literature to the importance of having proper management processes in place (Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Willems et al 2012). Management processes are directed by the association's policies and procedures. Therefore, knowledge of these policies and procedures is an important competency for a committee member to possess.

3.4.3.4 Knowledge of Legal Obligations

The only reference in the literature that could be found to the importance of legal obligations was in the report produced by the Productivity Commission (2010).

Failing to comply with the association's legal obligations can have serious consequences, lead to the loss of incorporated status and the loss of access to government funding. In addition, NPA committee members are held legally responsible for the management of the association's finances and affairs. Therefore, knowledge of legal obligations should be included as an element of knowledge.

3.4.4 Commitment

Commitment receives considerable support in the literature as an important factor associated with management performance. It is claimed that a strong relationship exists between commitment and individual performance in a management committee role with committed committee members reported to be more involved and more valuable to the association (Allen & Meyer 1996, Cornforth 2001, Doherty & Hoye 2011, Preston & Brown 2004).

3.4.5 Age

The relationship between age and job performance has been well researched in the for-profit sector and it is generally accepted that no relationship exists. However, these age/performance studies are criticised for producing results that may not be reliable due to the difficulty in measuring job performance (Maurer & Barbeite 2002). Aside from the reliability issue, the results of the for-profit studies may not be relevant for the non-profit sector if it can be established that non-profit committee members have an older age profile than the for-profit workers who are the focus of for-profit studies. The review of the literature found no references in the non-profit literature to studies which investigated the effect of aging on an individual's ability to perform management functions. However, a search of the medical literature on this subject found clear evidence to support its inclusion as a factor. Although a wide amount of variability exists across individuals, medical research has established a direct link between the aging of the brain and a decline in attention, memory and perception. The literature supports the view that higher order cognitive functions, such as decision making and problem solving, may also be affected by age (Glisky 2007). The research findings have implications for the competency of elderly committee members. One could argue that increased age could be associated with increased experience and knowledge so to some degree the affect of aging on cognitive skills may be offset by an increase in other competencies. Even if this is true, given the findings of the medical research, it is reasonable to conclude that the decline in cognitive skills associated with aging would make it more difficult for an elderly person to carry out some of their responsibilities, specifically, problem solving and decision making. Therefore age should be included as a factor when measuring management deficiency.

3.4.6 Resistance to Change

The need to include resistance to change, also referred to as "iced innovation", as a factor to be considered when measuring management deficiency is supported by a number of reference in the literature (Block, S. R. 2004; Jewell, J.2013; Taysir

& Taysir 2012). The existence of resistance to change within a committee could have a detrimental effect in a number of areas:

1. Reviewing the association's objectives set out in its mission statement to ensure it remains relevant in the present operating environment.
2. Implementing new policies and procedures.
3. Updating existing practices to incorporate new ideas and technology.
4. Making physical changes to improve the facility used.
5. Updating the association's image with new advertising and promotional material.
6. Introducing new types of activities to achieve the association's objectives.
7. Encouraging new members to join the association.

Inflexible, stubborn leadership that does not alter the association's programmes to respond to changes in the operating environment has been blamed for NPA failures in the US (Griesmann, D. 2012; Jewell, J. 2013). It has also been reported that, for many NPAs, the existence of resistance to change makes it difficult to implement change strategies that can break entrenched patterns of association behaviour (Block, S. R. 2004). Therefore, it is important to assess the extent to which resistance to change exists within a committee and investigate the relationship between resistance to change and individual management performance.

3.5 The Data Collection Instrument

3.5.1 Selecting the Data Collection Instrument

Before determining how each factor could be measured it was necessary to decide which type of data collection instrument would be used. Based on data collection methods used in related studies reported in the literature, two types of data collection instruments were considered: personal interviews and a self-administered survey.

Geographical, time and financial constraints made a personal interview approach to measuring the factors unfeasible. Therefore the approach adopted was a self-administered survey. The use of a self-administered survey is common in this field and it is claimed to produce reliable results (Jackson & Holland 1998, Willems et al 2012). However the survey has to be carefully constructed to reduce the effect of response bias as this method relies on committee members' perceptions of performance (Rogelberg & Stanton 2007). The common types of response bias are reviewed in Section 3.5.2.

The survey is an integral part of the model. It is the instrument that collects the data required to quantify each of the factors which are the variables that form the equations of the heuristic model. Therefore the reliability of the results produced by the model is dependent upon the ability of the survey to collect quality data.

3.5.2 Survey Response Bias

Response bias is an expected element of the results obtained from a self-administered survey. Even though the survey has been designed to reduce response bias as much as possible, some measure of bias will still exist (McColl et al 2001, Paulhus 1991, Peer & Gambiel 2011, Rogelberg & Stanton 2007, Villar 2008). The most common types of response bias and techniques used to avoid them are presented in the following sections. These techniques were employed in the development of the survey used to collect the data for this research project. The names given to the different types of bias have changed slightly over time but the definitions of each type of bias are largely unchanged. The names adopted for this project are those commonly in use.

3.5.2.1 Cognitive Response Bias

Cognitive response bias occurs when respondents answer a question in the way they think the researcher wants them to answer. The effect of this form of bias can be reduced by making sure that the wording of a question did not contain a leading opinion.

3.5.2.2 Acquiescence Response Bias

There is a tendency for survey respondents to agree with statements regardless of their content. Acquiescence response bias could influence the response to any question that involves confirming a statement (Holbrook 2013). As it is a particular problem with questions where the response is selected from an agree/disagree scale, the use of this form of question should be limited as much as possible.

3.5.2.3 Response Set Bias

Response set bias is more a problem for the overall design of the survey. If a continuous series of questions have scales that follow the same direction from a positive response to a negative response or the reverse of that, then there is a tendency for respondents to answer the questions in the same way without giving consideration to the content. To avoid this type of bias a balance between positive response/negative responses and left hand/right hand use of the scale should be built into the survey.

3.5.2.4 Social Acceptance Bias

Respondents often give answers that cast them in a positive light even though their answer is not an honest or truthful one (Quain 2013). It is a particular problem in questions that ask a respondent to rate their ability or level of competency in an area. Therefore this type of question should be avoided.

3.5.2.5 Non-response Bias

For this project there were two types of non-response bias to consider: non-response to a question and non-response to the whole survey. Non-response to a question was recorded as neutral by marking the centre of the Likert scale. This solution to question non-response, also referred to as passive non-response, is supported in the literature where it is claimed that passive non-response is not a source of bias for most self assessment surveys (Alexander et al 2011, Rogelberg et al 2007).

The effect of bias introduced by non-response to the whole survey was reduced by adopting administrative measures that are recommended in the literature (University of Texas at Austin 2011). These measures are designed to encourage the return of the completed survey. An outline of the survey administration process adopted for this project is provided in Section 3.5.3. For this study, there was no way of knowing whether people who chose not to complete and return the survey were significantly different in their level of management deficiency from those people who did return the survey. However, the claim by other researchers that a self-administered survey can produce reliable results (Jackson & Holland 1998, Willems et al 2012) were accepted for this study given that a survey administration process, which was designed to reduce the level of non-response bias as much as possible, was in place.

3.5.3 Survey Administration

The survey administration process developed for this project followed the practice recommended in the literature (University of Texas at Austin 2011) which can be summarised as: send out advanced notice, provide a stamped, return addressed envelope, send a reminder and offer an incentive. The application of each of these points to this project is outlined below.

Advanced Notice: A letter was sent to the president of each association advising that their association had been selected to participate in an important research project, asked for their help by participating and advised that they would soon receive a survey kit by post.

Survey Kit: Approximately two weeks after the initial contact, the survey kit was dispatched by post. The kit was delivered in a C4 size envelope and contained a covering letter addressed to the president and four copies of the survey in stamped, return addressed envelopes, one marked for each of the executive committee members (president, secretary, treasurer, vice-president).

Send a Reminder: Approximately four weeks after the survey kits would have been received, the number of responding committee members was noted for each association. A second kit was sent to those associations that had returned one or more of their surveys but not all four of them. It was assumed that associations for which no surveys had been returned were unlikely to respond to a second contact. The second kit contained a covering letter to the president which thanked those who had responded and provided another copy of the survey in a stamped, return addressed envelope marked for the attention of each non-respondent.

Incentive Offered: Both covering letters addressed to the president advised that, in return for all of the surveys being completed and returned from that association, they would receive a detailed assessment of the association's strengths and weaknesses. This assessment only reported the overall committee results with no individual respondent analysis provided so as not to place at risk the confidentiality of the data.

3.6 Quantifying Deficiency in the Identified Factors

Having selected a self-administered survey as the data collection instrument, designed a survey administration process and identified the main sources of survey response bias and recommended practices to avoid them, techniques were developed to quantify the level of deficiency in each factor.

3.6.1 Experience

Part of quantifying deficiency in experience involved relating experience gained to the length of time served in a management role. A subjective approach was adopted to define this relationship. While it is logical to assume that an individual's level of experience increases as the length of time spent working in a management role increases, the difficulty lies in aligning the level of experience with years of service. At the low end of the scale, service of 1 year or less could be associated with a very low level of experience so the problem was narrowed to defining the upper limit of a scale to associate with a very high level of experience.

It is well documented (Wikipedia On-line Encyclopaedia 2014) that the rate at which a person learns from experience in a job is highest after the initial experiences have been encountered and then gradually declines. From the direct experience in NPA management roles gained by this researcher, it was evident that an individual needs to complete a one year cycle in a role to experience all aspects of that role as some responsibilities, activities and events are annual in nature. This observation, combined with the learning rate information, made it reasonable to assume that an individual serving in the same role would still be learning aspects of that role for 2 to 3 years but after 4 years would be absorbing very little new information apart from changes to processes and the introduction of new technology. Therefore it would be reasonable to assume that after 4 years a very high level of experience would exist. Based on the above assessment, a 1 to 5 scale was selected. It was then assumed that deficiency in management experience could be quantified by associating 1 year or less serving in a role with the highest deficiency level of 5 and associating 4 years or more with the lowest deficiency level of 1.

3.6.2 Skills, Knowledge and Resistance to Change

The level of deficiency in skills, knowledge and resistance to change was quantified by formulating one or more questions which used a 5 point Likert-type scale. A scale ranging from 0 to 4 was the preferred option as a response of 0 would correspond to no deficiency. However, the most common 5 point scale

used is one ranging from 1 to 5. Therefore a 1 to 5 scale was selected as it would be familiar to many respondents. On this 5 point scale, 1 represents a high level of deficiency and 5 represents a low level of deficiency. This use of the scale is the reverse of normal practice where 1 is associated with a low rating and 5 is associated with a high rating. In order to remove possible confusion over this reverse use of the scale the questions were displayed with the numbers on the scale shown in the traditional way. To record the response made to these questions the scale was reversed. The responses were then modified by subtracting 1 to change the range of responses to the preferred range of 0 to 4. The above two-step process can be accomplished in one step by simply subtracting the initial response from 5. This process is illustrated in the following example:

Example 3.1. Recording Survey Responses with Scale Reversal

How important is belonging to this association in your personal life?	Extremely important **5** **4** **3** ~~**2**~~ **1** Not at all important

The respondent has marked the response "2". To record this response, first the scale was reversed and the response of 2 was changed to a response of 4. Then 1 was subtracted to give a modified response of 3. The modified response can be obtained in one step by subtracting the initial response, 2, from 5 to get the deficiency measurement of 3.

For some questions the initial response was a directly related to deficiency. For these questions, 1 was subtracted from the response to change to a 0 to 4 range of possible values, but there was no need to reverse the scale.

An example of the type of question to which this approach applies is provided below.

Example 3.2. Recording Survey Responses with No Scale Reversal

When we are looking for a new person to join the committee, I prefer to appoint a friend.	Strongly disagree 1 2 3 ~~4~~ 5 Strongly agree

This question was one of three that were designed to quantify the respondent's level of resistance to change. As the initial response to this question is directly related to deficiency, there is no need to reverse the scale and the modified

response can be calculated by subtracting 1 from the initial response. In this example, the initial response is 4 and the modified response is given by 4 – 1 = 3.

The questions designed to quantify each factor are displayed in Appendix A.

3.6.3 Age

Support for including age as a factor associated with management performance was provided in Section 3.5.5. The difficulty was in associating age groups with a level of management deficiency. A search of the literature found no reference to any study that investigated this relationship so no established technique was available to follow. Obtaining the age of a respondent was simple enough but what was required for this study was an estimate of the extent to which the respondent's age is a factor contributing to management deficiency. A subjective approach was adopted to quantify this factor.

The official retirement age in 2013 was 65. It was assumed that the effect of brain aging starts from that age. This assumption is supported by medical research into the effect of brain aging (Paddock 2007) which defined the older age group as 60 plus. The research found that the effects of brain aging were evident in individuals by the age of 70 indicating that the process must have started some time prior to that. A five point scale ranging from 1 to 5 was used to record the initial responses to this factor using five age groups: less than 65, 65 – 69, 70 – 74, 75 – 79, 80 or more. A respondent with an age of less than 65 years was assumed to have the lowest level of deficiency in this factor and would record an initial response of 1. A respondent with an age of 80 or more was assumed to have the highest level of deficiency in this factor and would record an initial response of 5.

3.6.4 Commitment

Three components of organisational commitment have been identified: affective, continuance and normative (Allen & Meyer 1996). Continuance commitment refers to the personal cost of leaving an organisation and normative commitment refers to a feeling of obligation to continue employment with the organisation. These two components were seen to have little relevance for un-paid volunteers working in an NPA and were not included in this study.

Affective commitment refers to an individual's emotional attachment to, identification with and involvement with the organisation. An individual with a high level of affective commitment will want to stay with the organisation. The questions developed by Allen and Meyer to quantify affective commitment in individuals working in the for-profit sector, were modified to make them more relevant to NPAs. In addition, to reduce the effect of acquiescence response bias which was defined in Section 3.5.2.2, the questions were re-worded to remove the use of an "agree/disagree" response which is prone to that type of bias. The questions developed to quantify commitment are listed in Appendix A.

3.7 Designing the Survey

The design of the survey was critical to the success of this project as it determined the quality of the data collected that was used to quantify the factors which are the variables in the model's equations. A major consideration in the design of the survey was to reduce response bias as much as possible by adopting practices which addressed the different types of response bias identified in section 3.5.2. Another important consideration was to avoid having a survey which respondents might consider to be too long. The survey was also designed in a way that would simplify processing the data collected. To this end, all respondents from each association completed identical surveys. The data collected for an association from each survey could then be processed by a single spreadsheet which was designed to modify responses as necessary to quantify the factors, carry out preliminary computations and enter the data into the model's equations.

The first pilot test conducted in this study actually consisted of two separate tests of the survey at different stages of its development. The initial survey, containing 59 questions, was tested using six respondents who were committee members of an NPA. After completion of the survey, a personal interview was conducted with each respondent to identify possible improvements to the overall structure of the survey and to identify questions which the respondents found confusing or difficult to answer. As a result of this process substantial changes were made to the survey to improve its effectiveness.

The number of questions was reduced as respondents found the survey to be too time consuming. In addition, an analysis of the responses to questions within a group of questions that were quantifying a single factor revealed that some questions produced identical responses from most of the respondents, indicating that they were probably not assessing different dimensions or properties of the factor. Some questions were modified to remove confusion over their meaning or in the choice of responses. An explanation of how to change an answer was also provided in the opening instructions.

Following these refinements to the data collection instrument, another test of the survey was conducted with five respondents who were also interviewed after they had completed the survey. This process focused on detecting response bias with the respondents questioned as to how they decided on their response to several questions. Following this process further refinements were made to the survey. Questions that were found to have a high level of social acceptance response bias were removed and replaced with questions that were related to shared responsibility rather than individual responsibility. A further refinement was to add two questions related to the committee's shared responsibility for important administrative processes: a comprehensive induction programme for new committee members and documenting policies and procedures. The number of questions in the refined survey was 36. Throughout this process of refining the data collection instrument, a great deal of consideration was given to the wording of each question with changes made where appropriate to improve the question's ability to quantify the factor and reduce the possibly of response bias as much as possible.

3.8 Testing the Refined Survey and Administration

A second pilot study was conducted to test the refined survey and the survey administration process which was presented in detail in Section 3.5.3. Three NPAs were selected for the test:

- The first NPA was located in a Queensland regional city with six committee members completing the survey. For this NPA the surveys were hand delivered to the respondents at a committee meeting and collected from them at the following committee meeting.
- The second NPA was located in an outer suburb of Brisbane with four committee members asked to complete the survey which was delivered by post.
- The third NPA was located in a Queensland regional city on the far north coast with surveys also delivered by post.

All six surveys handed out were returned by the committee members of the first NPA. All four of the surveys sent to the second NPA were returned, three initially and one after a follow up kit was sent. Despite a follow-up kit being sent, only two out of four surveys posted to the third NPA were returned which was insufficient to enable overall committee results to be produced. For posted surveys, the overall rate of return was 6 out of 8 or 75%. Although this result is derived from a very small sample it did provide an indication that the survey administration process should produce a satisfactory response rate.

The surveys returned were carefully analysed to detect instances where two or more questions used to quantify a single factor produced a high incidence of same response. Through this process no clear evidence emerged to indicate that a question should be removed from the survey leaving the final number of questions at 36. The final design of the survey is presented in Appendix B.

3.9 Conclusions

This chapter laid the foundation for building the heuristic model to measure management deficiency. After establishing the main responsibilities of a management committee, a model framework was built to identify the individual competencies and personal attributes required by a committee member to carry out these responsibilities. Options for a data collection instrument were assessed and a self-administered survey was selected as the preferred option. Techniques for quantifying the identified competencies and personal attributes were developed using subjective, qualitative techniques based on findings in the literature. Issues relating to the design of the data collection instrument to ensure that it could collect quality data were addressed and techniques for converting the initial responses collected into the modified responses required for the model were developed. A pilot test produced satisfactory results for the refined survey and the survey administration process.

The next chapter outlines how the knowledge gained from the review of the literature combined with the foundation laid in this chapter, was used to build a heuristic model to measure management deficiency.

Chapter 4. Developing the Initial Form of the Model

4.1 Introduction

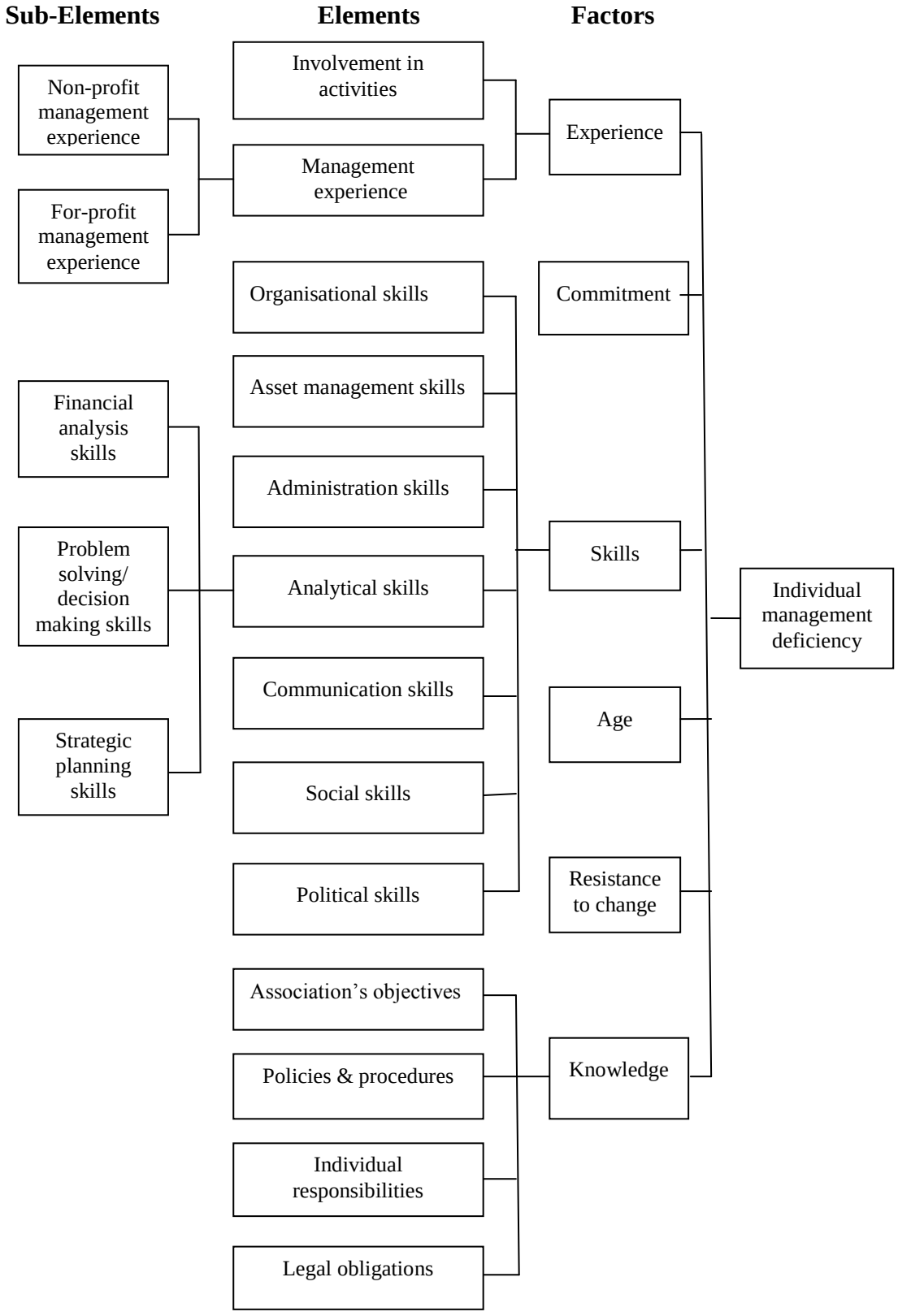
Chapter 3 laid the foundation for building a heuristic model to measure management deficiency. A model framework was built to identify the individual competencies and personal attributes necessary to carry out the responsibilities of a management committee. Options for a data collection instrument were analysed and a self-administered survey was selected as the preferred option. Techniques for quantifying the identified competencies and personal attributes were developed and the data collection instrument was designed and tested.

This chapter documents how the foundation laid by the review of the literature presented in Chapter 2, and the model framework developed in Chapter 3, was used to develop the initial form of a heuristic model that produces a meaningful and acceptable solution to the measurement of individual management deficiency. For this study, a solution is defined to be meaningful if it falls within the range of possible solutions and it is defined to be acceptable if the range and absolute value of the individual deficiency measurements produced by the model are not extreme.

4.2 The Structure of the Heuristic Model

The model framework presented in Chapter 3, Table 3.1 provided the structure for the heuristic model which is illustrated in Figure 4.1 below. It can be seen from the figure that the model has 25 variables. The process of determining the functional relationship between these variables is documented in the following sections.

Figure 4.1. The Structure of the Heuristic Model



4.3 Defining the Functional Relationship between Individual Management Deficiency and the Factors

In Chapter 3 it was established that individual competencies and personal attributes are the determining factors of management deficiency (Baruch & Ramalho 2006, Bagnoli & Megali 2011, Forbes 1998, Herman 1990, Sowa, Selden & Sandfort 2004, Taysir & Taysir 2012). Therefore, the search for an initial solution began by assuming that a functional relationship exists in which individual management deficiency is the dependent variable and individual competencies and personal attributes, which are collectively referred to as factors, are independent variables. This functional relationship can be represented by the following equation:

$$d = f(f_i)$$

where d = individual management deficiency and f_i are the factors.

The relationship between the independent variables is not known, therefore possible relationships needed to be considered and an option selected. As a heuristic approach was adopted for the development of the model, complex, higher order relationships were not considered as the aim of a heuristic approach is to simplify a complex problem as much as possible to obtain an initial solution.

Two possible relationships were considered:

1. A multiplicative relationship involving the product of the variables.
2. An additive relationship involving the sum of the variables.

In the first instance the possibility of a multiplicative relationship between the independent variables was considered. In a product of factors, if one of the factors has a value of zero then the product has a value of zero. Therefore, if the relationship between the independent variables in the model was a multiplicative relationship, then the measurement of individual management deficiency would be zero if just one of the factors had a value of zero. For example, consider a committee member who was found to have a very high level of deficiency in every factor except age which had an individual deficiency measurement of zero. A multiplicative relationship between the factors would produce an individual deficiency measurement of zero which was clearly not an acceptable outcome. This issue lead to the rejection of a multiplicative relationship. Therefore, it was assumed that the functional relationship between the independent variables was an additive or linear relationship. The individual management deficiency equation can then be written as:

$$d = \alpha_0 + \alpha_1 f_1 + \alpha_2 f_2 + \alpha_3 f_3 + \alpha_4 f_4 + \alpha_5 f_5 + \alpha_6 f_6$$

where d = individual management deficiency

f_1 = skills factor f_4 = commitment factor

f_2 = experience factor f_5 = resistance to change factor

f_3 = knowledge factor f_6 = age factor

α_i are constants $i = 0,1,2, \ldots ,6$

4.3.1 Initial Estimate of Response Bias Error

In the equation above, the constant term, α_0 , represents the response bias error for the respondent. As the data was collected using a self-administered survey, it must be assumed that there is some degree of response bias in the data for each individual respondent (Paulhus 1991). The technique that was used to estimate the level of response bias error is presented in Chapter 5, Section 5.2. This technique could not be applied until after the initial form of the model was developed and data was obtained from testing the model in a pilot study. Therefore, in the initial form of the model it was assumed that the response bias error was zero. That is, $\alpha_0 = 0$.

4.3.2 Initial Estimate of the Coefficients

At this point it should be mentioned that issues of multicollinearity and the need to use factor analysis to determine the least number of variables that account for the variation in individual levels of deficiency are not relevant for this study as the heuristic methodology adopted is not seeking to establish the true nature of the relationship between individual management deficiency and the factors. It was reported in Chapter 2, Section 2.3, that attempts to find the true relationship between a set of factors and management performance using traditional, analytical techniques have failed to produce a broadly accepted solution to the problem.

Following the heuristic approach, initial estimates of the coefficients of the independent variables in the individual management deficiency equation,

$$d = \alpha_0 + \alpha_1 f_1 + \alpha_2 f_2 + \alpha_3 f_3 + \alpha_4 f_4 + \alpha_5 f_5 + \alpha_6 f_6 ,$$

were obtained by making an assumption that simplified the problem. The coefficient of each variable serves as a weight for the value of that factor. It was assumed that each factor makes an equal contribution to the level of individual management deficiency. This assumption implies that the initial weight applied to each factor is 1 which means that the value of each coefficient in the above equation is 1. That is:

$$\alpha_i = 1 \text{ for } i = 1,2, \ldots 6$$

The initial form of the individual management deficiency model can then be written as:

$$d = f_1 + f_2 + f_3 + f_4 + f_5 + f_6$$

or

$$d = \sum_{i=1}^{6} f_i$$

where d = individual management deficiency

f_1 = skills factor
f_2 = experience factor
f_3 = knowledge factor
f_4 = commitment factor
f_5 = resistance to change factor
f_6 = age factor

4.4 Defining the Initial Relationship between the Factors, Elements and Sub-Elements

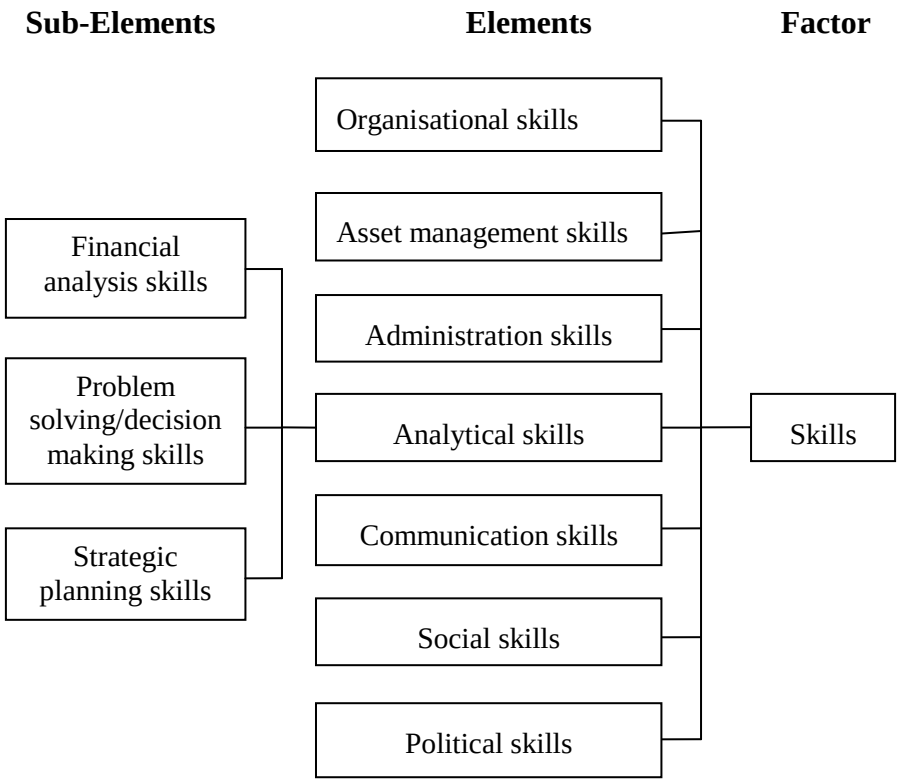
It can be seen from the structure of the heuristic model illustrated in Figure 4.1 that three of the factors, age, resistance to change and commitment, do not have a hierarchical structure of elements and sub-elements. The remaining factors, skills, experience and knowledge, do have a hierarchical structure and the relationship between the factors and their elements and sub-elements needed to be determined.

The same approach that was used in Section 4.3 to determine the initial form of the functional relationship between individual management deficiency and the factors was used to define the initial relationship between the factors and their elements and sub-elements. The remainder of this section will document the results obtained from following that approach.

4.4.1 The Skills Factor

The skills factor has seven elements and three sub-elements. The hierarchical structure of the skills factor is illustrated in Figure 4.2 below.

Figure 4.2. An Illustration of the Hierarchical Structure of the Skills Factor



Firstly, the relationship between the skills factor and its seven elements was examined. Following the same approach as that used in Section 4.3, it was assumed that the dependent variable, skills, is a linear function of its seven elements which are the independent variables in the linear function. Therefore, the skills factor equation can be written as:

$$f_1 = \beta_1 e_1 + \beta_2 e_2 + \beta_3 e_3 + \beta_4 e_4 + \beta_5 e_5 + \beta_6 e_6 + \beta_7 e_7$$

There is no need to include a constant term in this and all other lower order equations as response bias error is accounted for in the individual management deficiency equation.

For the initial form of the model it was again assumed that each element makes an equal contribution to the measurement of the skills factor. Therefore, the coefficients of each independent variable were again assumed to be 1 and the initial form of the skills factor equation can be written as:

$$f_1 = e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7$$

or

$$f_1 = \sum_{i=1}^{7} e_i$$

where:

f_1 = skills factor

e_1 = organisational skills element

e_2 = asset management skills element

e_3 = administration skills element

e_4 = analytical skills element

e_5 = communication skills element

e_6 = social skills element

e_7 = political skills element

4.4.2 The Analytical Skills Element

It can be seen from Figure 4.2 that the element analytical skills consists of three sub-elements: financial analysis skills, problem solving/decision making skills and strategic planning skills. Following the same approach as that used in Section 4.4.1, the initial form of the equation can be written as:

$$e_4 = s_1 + s_2 + s_3$$

or

$$e_4 = \sum_{i=1}^{3} s_i$$

Where

e_4 = analytical skills element

s_1 = financial analysis skills

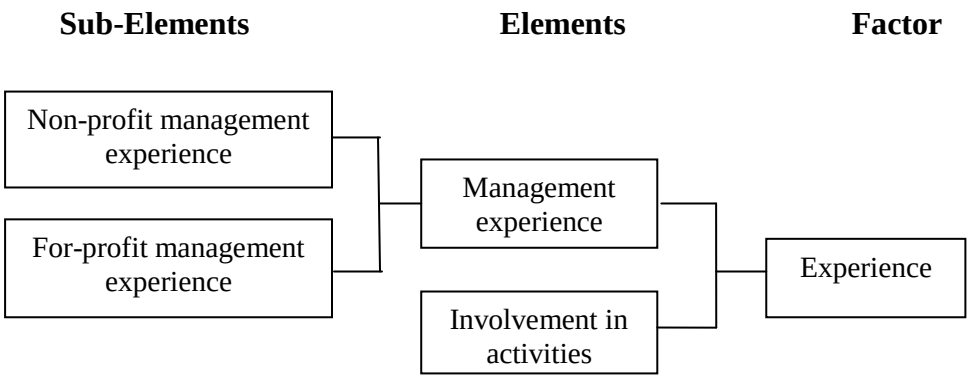
s_2 = problem solving/decision making skills

s_3 = strategic planning skills

4.4.3 The Experience Factor

The hierarchical structure of the experience factor is illustrated in Figure 4.3 below. It is evident that the experience factor has two elements, management experience and involvement in activities. The element, management experience, has two sub-elements, serving on the committee of a non-profit association and working in a management position in a for-profit business or company.

Figure 4.3. The Hierarchical Structure of the Experience Factor



Following the same process as that outlined in Section 4.4.1, the relationships between the experience factor and its elements and sub-elements were defined to be:

$f_2 = e_8 + e_9$ where

f_2 = experience factor

e_8 = management experience element

e_9 = activities element

and $e_8 = s_4 + s_5$ where

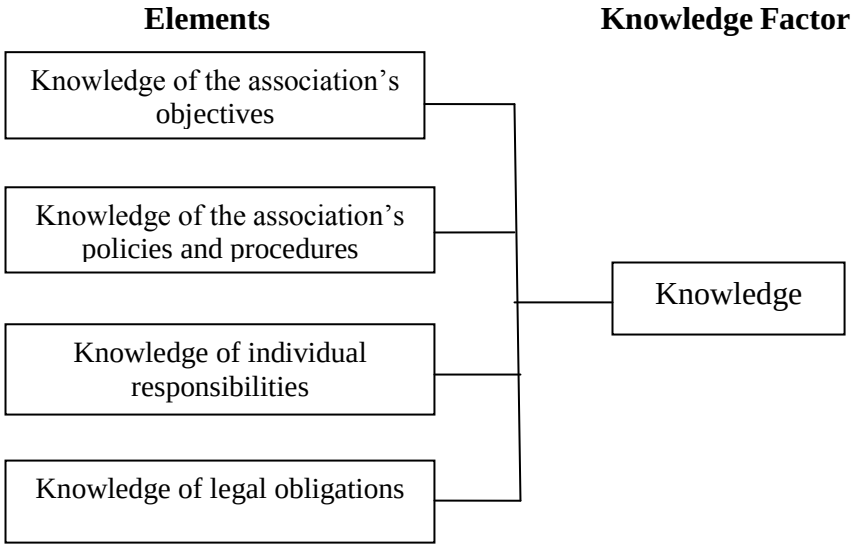
s_4 = non-profit management sub-element

s_5 = for-profit management sub-element

4.4.4 The Knowledge Factor

Figure 4.4 below illustrates the hierarchical structure of the knowledge factor. The figure shows that the knowledge factor has four elements: knowledge of the association's objectives, knowledge of the association's policies and procedures, knowledge of individual responsibilities and knowledge of legal obligations.

Figure 4.4. The Hierarchical Structure of the Knowledge Factor



Following the same process as that used for the skills factor presented in Section 4.4.1, the relationship between the knowledge factor and its elements was defined to be

$f_3 = e_{10} + e_{11} + e_{12} + e_{13}$ where

f_3 = knowledge factor

e_{10} = association objectives element

e_{11} = policies and procedures element

e_{12} = individual responsibilities element

e_{13} = legal obligations element

4.5 Defining the Initial Relationship between Committee Management Deficiency and Individual Management Deficiency

It was assumed that committee management deficiency, D, is a function of the individual management deficiencies, d. Following the same process presented in Section 4.4.1, it was assumed that this functional relationship is linear and for the initial form of the model, the coefficients of the independent variables were assumed to be 1. The initial form of the equation can then be written as:

$$D = d_1 + d_2 + \ldots + d_n$$

or

$$D = \sum_{i=1}^{n} d_i$$

where

n = the number of individual committee members

D = committee management deficiency

d = individual management deficiency

4.6 Summary of the Initial Form of the Model

A summary of the equations that comprise the initial form of the model is provided below.

Committee Management Deficiency:

$$D = \sum_{i=1}^{n} d_i$$

where

D = committee management deficiency

d = individual management deficiency

n = number of individuals

Individual Management Deficiency:

$$d = \sum_{i=1}^{6} f_i$$

where

f_1 = skills factor f_2 = experience factor f_3 = knowledge factor

f_4 = commitment factor f_5 = resistance to change factor

f_6 = age factor

Deficiency in Management Skills:

$$f_1 = \sum_{i=1}^{7} e_i$$

where

e_1 = organisational skills element e_2 = asset management skills element

e_3 = administration skills element e_4 = analytical skills element

e_5 = communication skills element e_6 = social skills element

e_7 = political skills element

Deficiency in Analytical Skills:

$$e_4 = \sum_{i=1}^{3} s_i$$

where

s_1 = financial analysis skills s_2 = problem solving/decision making

s_3 = strategic planning skills

Deficiency in Experience:

$$f_2 = e_8 + e_9$$

where

e_8 = management experience element e_9 = activities element

Deficiency in Management Experience:

$$e_8 = s_4 + s_5$$

where

s_4 = non-profit management sub-element

s_5 = for-profit management sub-element

Deficiency in Relevant Knowledge:

$$f_3 = \sum_{i=10}^{13} e_i$$

where

e_{10} = association objectives element e_{11} = policies and procedures element

e_{12} = individual responsibilities element e_{13} = legal obligations element

4.7 Standardising the Deficiency Measurements

4.7.1 Identifying a Measurement Interpretation Problem

The initial form of the model presented in Section 4.6 above, has a structure which aggregates measurements of deficiency within the model. It is evident that the deficiency measurement for a factor is dependent upon the number of elements and sub-elements associated with that factor. For example, the age factor has no elements or sub-elements while the skills factor has seven elements and three sub-elements. Therefore, considerable differences exist in the range of possible values for factor deficiency measurement. In this situation, it would be

impossible to make comparisons between the levels of deficiency across the factors. Furthermore, the absolute value of an individual factor deficiency measurement would be difficult to interpret as it is not related to a benchmark such as the maximum possible value of the measurement.

A similar problem arose with the measurement of committee management deficiency. Committee management deficiency was defined in Section 4.5 to be the sum of the individual deficiency measurements. Therefore, the maximum possible value of committee deficiency is dependent upon the number of individuals taking part in the survey. This situation is clearly not desirable as it would be difficult to interpret the result in a meaningful way. Unless the value of the committee deficiency measurement is related to a benchmark it may also not be possible to make comparisons between associations.

4.7.2 Producing Standardised Deficiency Measurements

The problems outlined in Section 4.7.1 were overcome by converting deficiency measurements into standardised deficiency ratios which are calculated by expressing the deficiency measurement for each survey question as the ratio of the deficiency measurement to its maximum possible value of 4. This process yields a value for each ratio which lies between 0 and 1. The deficiency ratio for each factor, element or sub-element can then be obtained by taking the average of the ratios derived from each question associated with that factor, element or sub-element. An example of this process, which shows three questions associated with a factor, is provided in Table 4.1 below.

Table 4.1. Converting Deficiency Measurements to Deficiency Ratios

	Measurement	Maximum	Ratio
Question 1	3	4	0.75
Question 2	1	4	0.25
Question 3	2	4	0.5
Factor Deficiency Ratio			**0.5**

The factor deficiency ratio is obtained by calculating the average of the ratios obtained for the three questions. This process was applied to the committee deficiency measurement, individual management deficiency measurements and to those factors and elements that aggregate deficiency ratios according to the model structure illustrated in Section 4.2, Figure 4.1. At each stage of processing data within the model, when an aggregation of deficiency ratios is performed, the average is taken to return the measurement to a range of 0 to 1.

Following this procedure lead to the definitions listed below:

1. The committee deficiency ratio is defined to be the average of the individual deficiency ratios.
2. Each individual management deficiency ratio is defined to be the average of its factor deficiency ratios.
3. Each factor deficiency ratio is defined to be the average of its element deficiency ratios, if any exist.
4. Each element deficiency ratio is defined to be the average of its sub-element deficiency ratios, if any exist.

With deficiency ratios for each factor, element and sub-element having a value ranging from 0 to 1, it is possible to make comparisons between them. It is also easier to make comparisons between the levels of management deficiency of individual committee members and between associations. The value of a deficiency measurement can also be readily converted to a percentage. The conversion of responses into deficiency ratios and the definitions listed above were built into the initial form of the model.

4.8 Incorporating Standardised Deficiency Measurements into the Model

The initial form of the model was modified to incorporate the definitions listed in Section 4.7.2 into the model's equations.

4.8.1 Modifying the Skills Equations

In Section 4.4.2, the equation for calculating deficiency in the analytical skills element, e_4 was defined to be:

$e_4 = s_1 + s_2 + s_3$ where

s_1 = financial analysis skills s_2 = problem solving/decision making skills

s_3 = strategic planning skills and $0 \leq s_i \leq 1$ for i = 1,2 or 3

The deficiency ratios for the sub-elements, s_i, are derived by calculating the average of the ratios for the questions associated with each sub-element. Table 4.2 in Section 4.7.2 provided an example of how this is achieved by first converting question responses to a ratio and then taking the average of those ratios. This process produces a measurement for each sub-element which lies between 0 and 1.

In Section 4.7.2, the analytical skills element was defined to be the average of the deficiency ratios of its sub-elements. As analytical skills has 3 sub-elements, the average of the sub-elements is found by dividing the summation, $s_1 + s_2 + s_3$ by 3. The equation for calculating deficiency in analytical skills became:

$$e_4 = (s_1 + s_2 + s_3) / 3$$

or $$e_4 = {}^1/_3 \ (s_1 + s_2 + s_3)$$

The procedure outlined above was applied to the equation for calculating deficiency in the skills factor which has 7 elements. The result is presented below:

The equation $f_1 = e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7$

became $f_1 = (e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7) / 7$

or $f_1 = {}^1/_7 (e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7)$

where

f_1 = skills factor

e_1 = organisational skills element

e_2 = asset management skills element

e_3 = administration skills element

e_4 = analytical skills element

e_5 = communication skills element

e_6 = social skills element

e_7 = political skills element

and $0 \leq e_i \leq 1$ for $i = 1,2, \ldots 7$

4.8.2 Modifying the Remaining Equations

The remaining equations of the model were modified by following the same process as that outlined in Section 4.8.1. The results are presented below.

Management Experience Element.

The equation $e_8 = s_4 + s_5$ became $e_8 = {}^1/_2 \ (s_4 + s_5)$ where

e_8 = management experience element

s_4 = non-profit management sub-element

s_5 = for-profit management sub-element and $0 \leq s_i \leq 1$ for $i = 4$ or 5

The Experience Factor

The equation $f_2 = e_8 + e_9$ became $f_2 = {}^1/_2 (e_8 + e_9)$ where

f_2 = experience factor

e_8 = management role element

e_9 = activities element

and $0 \leq e_i \leq 1$ for $i = 8$ or 9

The Knowledge Factor

The equation $f_3 = e_{10} + e_{11} + e_{12} + e_{13}$

became $f_3 = {}^1/_4 (e_{10} + e_{11} + e_{12} + e_{13})$ where

f_3 = knowledge factor

e_{10} = association objectives element

e_{11} = policies and procedures element

e_{12} = individual responsibilities element

e_{13} = legal obligations element

and $0 \leq e_i \leq 1$ for $i = 10, 11, 12$ or 13

Individual Management Deficiency

The equation $d = f_1 + f_2 + f_3 + f_4 + f_5 + f_6$

became $d = {}^1/_6 \, (f_1 + f_2 + f_3 + f_4 + f_5 + f_6)$ where

d = individual management deficiency f_1 = skills factor

f_2 = experience factor f_3 = knowledge factor

f_4 = commitment factor f_5 = resistance to change factor

f_6 = age factor and $0 \leq f_i \leq 1$ for $i = 1,2, \ldots 6$

Committee Management Deficiency

The equation

$$D = \sum_{i=1}^{n} d_i$$

became

$$D = {}^1/_n \sum_{i=1}^{n} d_i$$

where

D = committee management deficiency d = individual management deficiency

n = number of individuals and $0 \leq d_i \leq 1$ for $i = 1,2, \ldots n$

4.9 Summary of the Heuristic Model with Modified Equations

A summary of the initial form of the model with the modifications needed to incorporate standardised deficiency ratios is presented below. At this stage of the model's development it should be remembered that no loadings or weights have been assigned to the independent variables.

Committee Management Deficiency:

$$D = {}^1/_n \sum_{i=1}^{n} d_i$$

Individual Management Deficiency:

$$d = {}^1/_6 \sum_{i=1}^{6} f_i$$

Deficiency in Management Skills:

$$f_1 = {}^1/_7 \sum_{i=1}^{7} e_i$$

Deficiency in Analytical Skills:

$$e_4 = {}^1/_3 \sum_{i=1}^{3} s_i$$

Deficiency in Experience:

$$f_2 = {}^1/_2 (e_8 + e_9)$$

Deficiency in Management Experience:

$$e_8 = {}^1/_2 (s_4 + s_5)$$

Deficiency in Relevant Knowledge:

$$f_3 = {}^1/_4 \sum_{i=10}^{13} e_i$$

where

D = committee management deficiency d = individual management deficiency

n = number of individuals

f_1 = skills factor f_2 = experience factor

f_3 = knowledge factor f_4 = commitment factor

f_5 = resistance to change factor f_6 = age factor

e_1 = organisational skills element e_2 = asset management skills element

e_3 = administration skills element e_4 = analytical skills element

e_5 = communication skills element e_6 = social skills element

e_7 = political skills element e_8 = management experience element

e_9 = activities element e_{10} = association objectives element

e_{11} = policies and procedures element

e_{12} = individual responsibilities element

e_{13} = legal obligations element

s_1 = financial analysis skills s_2 = problem solving/decision making

s_3 = strategic planning skills s_4 = non-profit management sub-element

s_5 = for-profit management sub-element

4.10 Testing the Initial Form of the Model

4.10.1 Testing the Data Processing Spreadsheet

A data processing spreadsheet was designed to receive the data collected by the postal survey. One spreadsheet was prepared for each NPA which processed the data received for each individual committee member and produced averages of the individual results to provide an overall committee assessment of deficiency in each factor. The spreadsheet was tested using data from two respondents collected

during the second pilot test for the survey. The objective was to determine whether the spreadsheet was correctly modifying the initial responses, converting the modified responses to deficiency ratios and correctly processed the data according to the equations of the initial form of the model. The output of the spreadsheet was carefully checked against manual calculations. The test established that the spreadsheet was performing all calculations correctly according to the data processing requirements of the model.

4.10.2 Pilot Test Results

It was reported in Chapter 3, Section 3.8 that six members of an NPA management committee participated in the second pilot test conducted to assess the refined survey. The data collected from this NPA was used for the pilot test of the model in its initial form. The survey responses for each committee member were entered into a data processing spreadsheet and the model produced a detailed assessment of management deficiency for each individual across the range of factors that are the model's independent variables. The results produced by the model are presented in Table 4.2 below.

Table 4.2. Pilot Test Results

	Deficiency Ratios						
Respondent	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Age	**0.50**	**0.00**	**0.75**	**0.25**	**0.25**	**0.25**	**0.33**
Resistance to Change	**0.17**	**0.33**	**0.42**	**0.17**	**0.33**	**0.08**	**0.25**
Commitment	**0.17**	**0.33**	**0.33**	**0.33**	**0.33**	**0.25**	**0.29**
Financial Skills	0.00	0.58	0.50	0.00	0.50	0.42	0.33
Problems/Decisions	0.00	0.00	0.13	0.00	0.38	0.25	0.13
Strategic Planning	0.13	0.38	0.00	0.50	0.38	0.00	0.23
Analytical Skills	**0.04**	**0.32**	**0.21**	**0.17**	**0.42**	**0.22**	**0.23**
Asset Management	0.00	0.25	0.50	0.00	0.50	0.75	0.33
Administration Skills	0.46	0.29	0.79	0.25	0.63	0.38	0.47
Organisational Skills	0.13	0.25	0.13	0.38	0.25	0.38	0.25
Communication Skills	0.00	0.63	0.25	0.25	0.25	0.50	0.31
Social Skills	0.13	0.38	0.50	0.13	0.25	0.13	0.25
Political Skills	0.00	0.75	1.00	0.25	1.00	1.00	0.67
Skills	**0.11**	**0.41**	**0.48**	**0.20**	**0.47**	**0.48**	**0.36**
Management Experience	0.25	0.50	0.50	0.00	0.50	1.00	0.46
Activities Involvement	0.25	0.50	1.00	0.50	0.25	0.50	0.50
Experience	**0.25**	**0.50**	**0.75**	**0.25**	**0.38**	**0.75**	**0.48**
Objectives	0.00	1.00	0.50	0.50	0.00	0.75	0.46
Policies & Procedures	0.00	0.38	0.13	0.13	0.75	0.63	0.33
Legal Obligations	0.25	0.25	0.50	0.25	0.50	0.75	0.42
Individual Responsibilities	0.00	0.50	0.00	0.25	0.50	1.00	0.38
Knowledge	**0.06**	**0.53**	**0.28**	**0.28**	**0.44**	**0.78**	**0.40**
Individual Deficiency	**0.21**	**0.35**	**0.50**	**0.25**	**0.37**	**0.43**	
Committee Deficiency							**0.35**

The model produced individual deficiency measurements ranging from 0.21 to 0.50 or 21% to 50%. These results are meaningful and acceptable in terms of their

absolute value and range as they lie within the range of possible values for a deficiency measurement, 0 to 1, and they are not extreme values. They also demonstrated that the model is able to differentiate between the levels of management deficiency in individual committee members. The committee deficiency measurement of 0.35 or 35% is also a meaningful and acceptable solution to the measurement of this committee's overall level of management deficiency. It is evident from the results presented in Table 4.3 that the model is able to identify substantial differences in the average level of deficiency across the sub-elements, elements and factors with average factor deficiency measurements ranging from 0.13 to 0.67 or 13% to 67% deficiency.

The results produced by the model enable a detailed assessment of the strengths and weaknesses of individual committee members and the committee as a whole to be carried out. A high level assessment of overall committee strengths and weaknesses is provided below.

Strengths:

Resistance to Change. Deficiency in this factor was assessed to be only 25% which indicates that this committee has a progressive outlook and is willing to accept change.

Commitment. A 29% deficiency in this factor indicates that the members of this committee have quite a high level of commitment to the association.

Weaknesses:

Experience. A relatively high level of deficiency in experience was observed in the results. This was partly due to a new recruit to the committee having no previous management experience in either a non-profit association or a for-profit organisation.

Relevant Knowledge. There was wide variation in individual deficiency ratios for this factor but the results indicate that knowledge of the association's objectives requires attention.

The results demonstrated that the model, even in its initial form, is able to deliver actionable information that could form the basis for effectively targeting a management development programme for this committee.

4.11 Conclusion

In was established in the review of the literature provided in Chapter 2 that researchers have been attempting to measure the management performance of an NPA committee for more than three decades without success. The traditional, analytical approach they adopted in past studies has failed to produce a solution that has broad acceptance.

The heuristic modelling process followed in this chapter required a number of assumptions to be made concerning the relationships between the identified dependent and independent variables. These assumptions were in keeping with the heuristic model development process which aims to simplify a complex problem to enable an initial solution to be found. The heuristic process resulted in the initial form of a model being built. A pilot test produced a satisfactory initial

solution to the measurement of individual management deficiency in a non-profit association.

The next chapter follows the application of the simulated annealing heuristic modelling process to carry out refinements to the model to produce better solutions.

Chapter 5. Refining the Heuristic Model

5.1 Introduction

Chapter 4 covered the development of the initial form of the heuristic model to measure management deficiency in a non-profit association. In a pilot test the model produced an initial solution that was meaningful and acceptable.

This chapter documents the application of the simulated annealing process to progressively refine the model and obtain better solutions. Techniques were developed to estimate the level of response bias and estimate the coefficients of the independent variables in each of the model's equations. Following the simulated annealing methodology, the new solutions produced by each refinement were tracked and a clear solution path emerged.

5.2 Refinement 1: Estimating Survey Response Bias

The results obtained from the pilot test of the initial form of the heuristic model using data collected from six committee members of an NPA were presented in Chapter 4, Section 4.10.2, Table 4.2. The results are duplicated in Table 5.1 below as they will be referred to throughout this chapter.

Table 5.1. Pilot Test Results

	Deficiency Ratios						
Respondent	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Age	**0.50**	**0.00**	**0.75**	**0.25**	**0.25**	**0.25**	**0.33**
Resistance to Change	**0.17**	**0.33**	**0.42**	**0.17**	**0.33**	**0.08**	**0.25**
Commitment	**0.17**	**0.33**	**0.33**	**0.33**	**0.33**	**0.25**	**0.29**
Financial Skills	0.00	0.58	0.50	0.00	0.50	0.42	0.33
Problems/Decisions	0.00	0.00	0.13	0.00	0.38	0.25	0.13
Strategic Planning	0.13	0.38	0.00	0.50	0.38	0.00	0.23
Analytical Skills	**0.04**	**0.32**	**0.21**	**0.17**	**0.42**	**0.22**	**0.23**
Asset Management	0.00	0.25	0.50	0.00	0.50	0.75	0.33
Administration Skills	0.46	0.29	0.79	0.25	0.63	0.38	0.47
Organisational Skills	0.13	0.25	0.13	0.38	0.25	0.38	0.25
Communication Skills	0.00	0.63	0.25	0.25	0.25	0.50	0.31
Social Skills	0.13	0.38	0.50	0.13	0.25	0.13	0.25
Political Skills	0.00	0.75	1.00	0.25	1.00	1.00	0.67
Skills	**0.11**	**0.41**	**0.48**	**0.20**	**0.47**	**0.48**	**0.36**
Management Experience	0.25	0.50	0.50	0.00	0.50	1.00	0.46
Activities Involvement	0.25	0.50	1.00	0.50	0.25	0.50	0.50
Experience	**0.25**	**0.50**	**0.75**	**0.25**	**0.38**	**0.75**	**0.48**
Objectives	0.00	1.00	0.50	0.50	0.00	0.75	0.46
Policies & Procedures	0.00	0.38	0.13	0.13	0.75	0.63	0.33
Legal Obligations	0.25	0.25	0.50	0.25	0.50	0.75	0.42
Individual Responsibilities	0.00	0.50	0.00	0.25	0.50	1.00	0.38
Knowledge	**0.06**	**0.53**	**0.28**	**0.28**	**0.44**	**0.78**	**0.40**
Individual Deficiency	**0.21**	**0.35**	**0.50**	**0.25**	**0.37**	**0.43**	
Committee Deficiency							**0.35**

Chapter 5. Refining the Heuristic Model

One of the initial assumptions made in Chapter 4 was that the level of survey response bias is zero. The evidence from the literature suggests that this assumption is not realistic. Response bias is an expected element of the results obtained from a self-administered survey (McColl et al 2001, Paulhus 1991, Peer & Gambiel 2011, Rogelberg & Stanton 2007, Villar 2008). Even though the survey has been designed to reduce response bias as much as possible, some measure of bias will still exist. The following technique, which follows the practice recommended by Paulhus (1991), was developed to estimate the level of survey response bias.

1. Using the data collected from a sample, calculate the mean of the individual deficiency measurements.
2. Assume the population of individual deficiency measurements has a mean of 50% or 0.5. This assumption is based on two important characteristic of NPA committee members. Firstly they are mostly unpaid volunteers (Productivity Commission 2010). Secondly, NPAs often find it difficult to fill a committee vacancy with a person who possesses a high level of management skills and experience (Brown 2007, Productivity Commission 2010). Therefore it is reasonable to assume that the average committee member would be in an equally balanced position between being deficient in some areas of competency and not deficient in other areas of competency.
3. The difference between the two means in points 1 and 2 above is an estimate of the level of survey response bias.

The technique to estimate response bias was applied to the results obtained from the pilot test which are presented in Section 5.2, Table 5.1.

Sample mean deficiency ratio = 0.35

Estimate of the population mean deficiency ratio = 0.50 from point 2 above.

Estimate of Survey Response Bias = 0.50 – 0.35

= 0.15

As this result is a preliminary estimate based on a small sample, the result was rounded down to 0.1 to provide a refined estimate of survey response bias. Further refinement was carried out when a larger amount of data was available at a later stage of the project.

In Chapter 4, Section 4.7.4 the initial form for the individual management deficiency equation was defined to be;

$$d = \frac{1}{6}(f_1 + f_2 + f_3 + f_4 + f_5 + f_6)$$

where d = individual management deficiency

f_1 = skills factor

f_2 = experience factor

f_3 = knowledge factor

f_4 = commitment factor

f_5 = resistance to change factor

f_6 = age factor

and $0 \leq f_i \leq 1$ for $i = 1,2, \ldots 6$

In the above equation the constant term, representing survey response bias, is not shown as one of the initial assumptions made in Chapter 4, Section 4.3.1 was the level of survey response bias is zero. Using the refined estimate of 0.1, the equation for calculating individual management deficiency became:

$$d = 0.1 + {}^{1}/_{6} (f_1 + f_2 + f_3 + f_4 + f_5 + f_6)$$

This refinement was incorporated into the data processing spreadsheet and the data collected from the pilot test was re-processed. The change in the measurement of individual management deficiency is shown in Table 5.2 below.

Table 5.2. Refinement 1 Results

	Individual Management Deficiency Ratios						
Respondent	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Initial Results	0.21	0.35	0.50	0.25	0.37	0.43	0.35
Refinement 1	0.31	0.45	0.60	0.35	0.47	0.53	0.45

The solution produced by refinement 1 represents the start of the simulated annealing model refinement process (Kirkpatrick, Gelatt & Vecchi 1983). From this starting point, small refinements continued to be made to the model to produce new solutions which were plotted to determine the direction in which they are heading. The simulated annealing process involves checking to see if the new solution is better than the previous one. In this context, "better" means the refinement has successfully incorporated new information into the model and produced a solution which follows a path or direction towards the optimal state of the model. If the new solution is better it is accepted and the process continues until the model reaches its optimal state or some predetermined number of refinements has been carried out. If a new solution is worse, it is not immediately rejected as a local maximum or minimum may have been encountered or a refinement may have moved the model to a new solution path.

5.3 Refinement 2: Estimating the Coefficients in the Individual Management Deficiency Equation

In Chapter 4 it was assumed that, for each of the model's equations, the independent variables are equally important in determining the value of the dependent variable. This assumption led to an initial estimate of 1 for the coefficients of the independent variables. If it can be established that there is variability in the importance of the independent variables in determining the value of each dependent variable in the set of equations that form the model, then the

assumption that the coefficients of the independent variables are 1 is false. It would then be necessary to determine what the value of the coefficients should be.

5.3.1 Determining Weights for the Factors

In this model, the six factors of individual management deficiency are skills, experience, knowledge, commitment, resistance to change and age. The objective was to investigate the relative importance of the contribution that each of these factors makes to the overall performance of the management committee and, if the investigation reveals that the contributions are different, weight them accordingly. The underlying assumption was that the more important a factor is to the performance of the committee, the more important will be deficiency in that factor. This assumption was adopted throughout this chapter. The review of the literature found substantial differences in the level of importance placed on the six factors.

More studies identified a positive relationship between management skills and management performance than any other factor (Forbes 1998, Green and Griesinger 1996, Langabeer & Galeener 2007, Nicholson et al 2012, Tucker & Parker 2013, Willems et al 2012). Social skills, particularly teamwork, were also found to be important in several studies (Cornforth 2001, McDonagh 2006, Parker 2007, Schjoedt & Kraus 2009, Thach & Thompson 2007). Therefore, the skills factor was given the highest ranking.

After skills, relevant management experience was found to be an important competency for management team members (Brown 2007, Nafukho 2007, Schjoedt & Kraus 2009, Thach & Thompson 2007). A lack of management experience has also been identified as a major cause of NPA failures (Productivity Commission 2010). Therefore the experience factor was ranked second.

The importance of knowledge as a factor contributing to management performance was identified in several studies (Brown 2007, Nafukho 2007, Schjoedt & Kraus 2009, Thach & Thompson 2007) but there was no evidence to place it ahead of commitment, the importance of which also received considerable support in the literature (Allen & Meyer 1996, Cornforth 2001, Doherty & Hoye 2011, Preston & Brown 2004). Therefore knowledge and commitment were given equal ranking behind experience.

The review of the literature found no references to studies that investigated the relationship between age and resistance to change to non-profit management performance. Therefore these factors were ranked last.

The difference in the importance ranking of the six factors was built into the model by applying a loading or weight associated with each factor's importance ranking. For this study the term weight will be used rather than loading. The weights became the coefficients of the independent variables representing the factors. The review of the literature found no objective, analytical technique that could assist in quantifying the weights. However, in a wine industry study conducted by Nooriafshar and Vibert (2012) the factors that were found to contribute to success were ranked according to their perceived importance. They then applied weights to the factors using values obtained by reversing the rank order. In this way, the most important factor received the highest weight and the least important factor received the lowest weight. This approach was adopted for this study to produce estimates of the coefficients of the independent variables.

The ranking of the factors determined from the review of the literature and the corresponding weights obtained by applying the approach outlined above are displayed in Table 5.3.

Table 5.3. Ranking and Weights for the Individual Management Deficiency Factors

Factor	Ranking	Weight
Skills	1	6
Experience	2	5
Knowledge	3 =	3.5
Commitment	3 =	3.5
Age	5 =	1.5
Resistance to Change	5 =	1.5

The weights allocated to the six factors are revised estimates of their coefficients in the individual management deficiency equation.

5.3.2 Refining the Individual Management Deficiency Equation

In Section 5.2 the equation for individual management deficiency was defined to be:

$$d = 0.1 + {}^{1}/_{6}\,(f_1 + f_2 + f_3 + f_4 + f_5 + f_6)$$

where d = individual management deficiency

f_1 = skills factor f_4 = commitment factor

f_2 = experience factor f_5 = resistance to change factor

f_3 = knowledge factor f_6 = age factor

and $0 \le f_i \le 1$ for $i = 1,2, \ldots 6$

When the weights listed in Table 5.3 were incorporated into this equation, the expression

$$f_1 + f_2 + f_3 + f_4 + f_5 + f_6$$

became: $6f_1 + 5f_2 + 3.5f_3 + 3.5f_4 + 1.5\,f_5 + 1.5f_6$

The need to standardise deficiency measurements to a range of 0 to 1 was established in Chapter 4, Section 4.6. The revised estimates of the coefficients changed the deficiency measurement range from 0 to 6 for the expression

$$f_1 + f_2 + f_3 + f_4 + f_5 + f_6$$

to a range of 0 to 21 for the expression

$$6f_1 + 5f_2 + 3.5f_3 + 3.5f_4 + 1.5\,f_5 + 1.5\,f_6$$

Therefore, it was necessary to divide this expression by 21 to return the deficiency measurement to a range of 0 to 1. The formula for calculating individual management deficiency then became:

$$d = 0.1 + {}^{1}/_{21}\,(6f_1 + 5f_2 + 3.5f_3 + 3.5f_4 + 1.5\,f_5 + 1.5\,f_6)$$

or

$$d = 0.1 + 0.286\,f_1 + 0.238\,f_2 + 0.167\,f_3 + 0.167\,f_4 + 0.071\,f_5 + 0.071\,f_6$$

The equation for individual management deficiency was changed to create a refined version of the model and a new solution was produced. The results are presented in Table 5.4 below which provides a comparison of the new solution with that obtained from refinement 1.

Table 5.4. Refinement 2 Results

	Individual Management Deficiency Ratios						
Respondent	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Refinement 1	0.31	0.45	0.60	0.35	0.47	0.53	0.45
Refinement 2	0.28	0.50	0.60	0.35	0.49	0.61	0.47
Change	-0.03	0.05	0	0	0.02	0.08	0.02
Percentage Change (%)	- 9.7	11.1	0	0	4.3	15.1	4.4

The effect on the six respondents of the refinement was quite varied with the change in individual management deficiency ratios ranging from a 9.7% decrease to a 15.1% increase. The average change in management deficiency, which is the overall committee result, was a 4.4% increase. This result demonstrates that the refinement has effectively taken into account the relative importance of the individual factors to produce a new solution. Following the simulated annealing

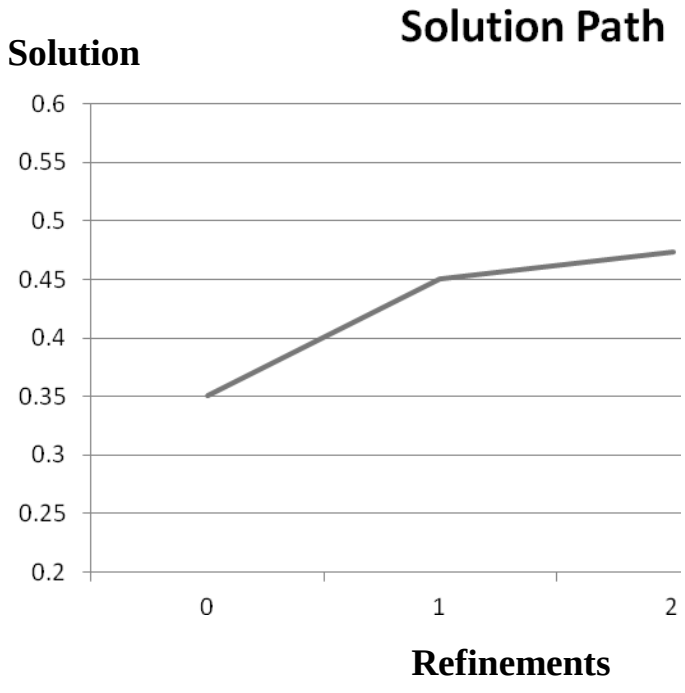
methodology, new solutions need to be tracked to determine whether a solution path is emerging. The solutions obtained from the first two refinements to the model are displayed in Table 5.5 below. The table shows the committee deficiency ratios which are the average of the individual deficiency ratios.

Table 5.5 Tracking New Solutions: Refinements 1 and 2

No.	Refinement Description	Committee Deficiency
	Initial Solution	0.351
1	Estimate Response Bias	0.451
2	Estimate Individual Deficiency Coefficients	0.473

The data displayed in Table 5.5 is illustrated in Figure 5.1 below.

Figure 5.1. The Solution Path, Refinements 1 and 2



The chart illustrates that after the first two refinements the new solutions are tracking on a satisfactory path but the chart does not indicate that an optimal state for the model has yet been reached. However, the chart provides sufficient evidence to accept that the new solutions are better solutions, according to the

definition of "better solution" provided in Section 5.2. Therefore the equation for individual management deficiency was changed from

$d = 0.1 + {}^{1}/_{6} (f_1 + f_2 + f_3 + f_4 + f_5 + f_6)$ to

$d = 0.1 + {}^{1}/_{21} (6f_1 + 5f_2 + 3.5f_3 + 3.5f_4 + 1.5 f_5 + 1.5 f_6)$ or

$d = 0.1 + 0.286 f_1 + 0.238 f_2 + 0.167 f_3 + 0.167 f_4 + 0.071 f_5 + 0.071 f_6$

where d = individual management deficiency

f_1 = skills factor f_4 = commitment factor

f_2 = experience factor f_5 = resistance to change factor

f_3 = knowledge factor f_6 = age factor

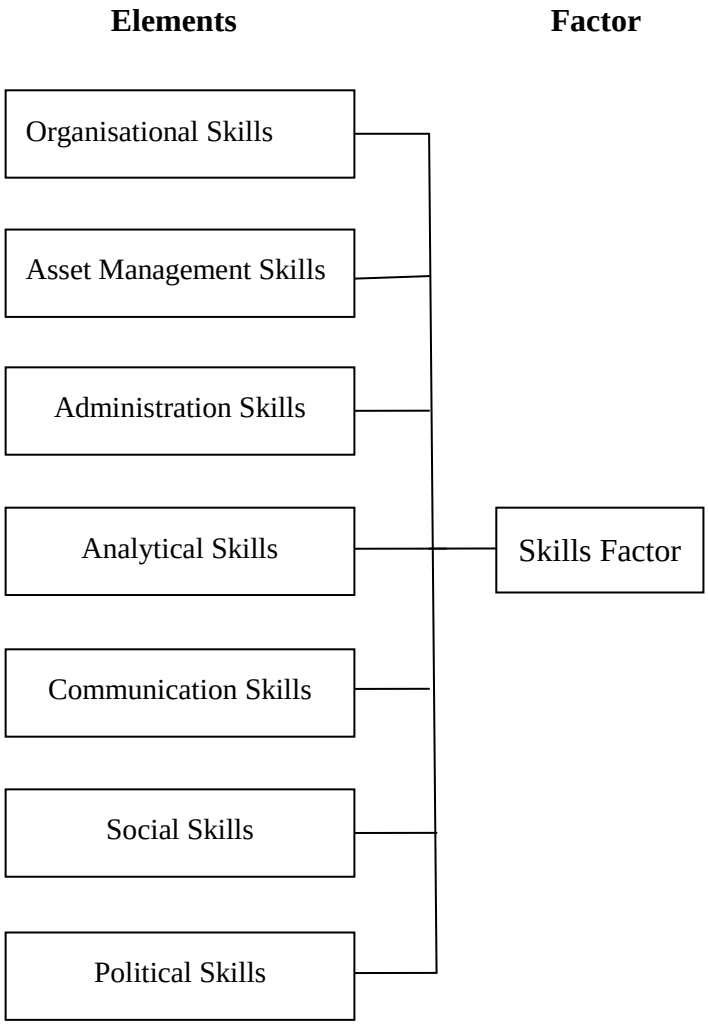
and $0 \leq f_i \leq 1$ for $i = 1,2, \ldots 6$

5.4 Refinement 3: Estimating the Coefficients in the Skills Factor Equation

5.4.1 Determining Weights for the Skills Factor Elements

The skills factor has seven elements which are illustrated in Figure 5.2 below.

Figure 5.2. The Hierarchical Structure of the Skills Factor



The objective for this section was to determine whether there is a difference in the relative importance of the contribution that each of these elements makes to the overall measurement of the skills factor and, if differences are found, weight them accordingly. Once again the literature was consulted to find evidence that would assist in ranking the elements.

The review of the literature provided evidence that two sub-elements of the analytical skills element, financial skills and strategic planning, are important competencies for committee members to possess (Bhardwaj & Vuyyuri 2005, Brown 2005, Brown & Iverson 2004, Forbes 1998, Green & Griesinger 1996, Harrison & Sexton 2004, Jackson & Holland 1998, Langabeer & Galeener 2007, Taysir & Taysir 2012, Tucker 2010, Tucker & Parker 2013, Willems et al 2012). For this reason, the analytical skills element was given the highest ranking.

There is a considerable amount of reference in the literature to the importance of sound management practices to overall association performance (Brown 2007, Cornforth 2001, Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002,

Willems et al 2012). Specific mention is given to having policies and procedure documented and followed, a comprehensive induction or orientation programme for new committee members and role descriptions documented and distributed to committee members. In this project these practices are placed in the area of administration skills. Therefore this element was ranked second.

Recent research has identified social skills as an important factor contributing to committee performance (Alexander et al 2011, McDonagh 2006, Nicholson et al 2012, Thach & Thompson 2007). Good social skills are required to develop a sense of cohesion (Thach & Thompson 2007) and collaborative board functioning (McDonagh 2006) which have been found to be positively associated with management performance. As a result of this finding, the social skills element was ranked third in importance.

In Chapter 3, Section 3.3 achieving the association's objectives contained in the mission statement was listed as one of the main responsibilities of the management committee (Bagnoli & Megali 2011, Epstein & McFarlan 2011, Forbes 1998, Sawhill & Williamson 2001). The events and activities that the association organises lead the association towards the achievement of its objectives. It follows that a management committee needs to contain people with the necessary organisational skills to efficiently manage these events and activities. However, there is no clear evidence in the literature to indicate that organisational skills should be given a lower ranking than social skills. Consequently, the organisational skills element was ranked equal third in importance.

Willems et al (2012) found that developing good relationships with stakeholders was an important factor. The main stakeholders are the members of the association, the sponsors and members of the local council and State Government with whom the association has contact. Developing good relationships with these stakeholders involves both political skills, which was identified in the model framework presented in Chapter 3, Table 3, and communication skills. As no specific reference to the remaining element, asset management skills, could be found in the literature, the communication skills and political skills elements were ranked in equal fifth place and asset management skills element was ranked last.

The adopted approach was followed to assign weights to each element by first ranking them and then reversing the order of the rankings. Table 5.6 below shows the rank order of the elements and the weights that were applied to them.

Table 5.6. Ranking and Weights for the Skills Factor Elements

Element	Variable	Ranking	Weight
Analytical Skills	e_4	1	7
Administration Skills	e_3	2	6
Social Skills	e_6	3 =	4.5
Organisational Skills	e_1	3 =	4.5
Political Skills	e_7	5 =	2.5
Communication Skills	e_5	5 =	2.5
Asset Management Skills	e_2	7	1

The weights allocated to the seven elements are revised estimates of their coefficients in the skills factor equation.

5.4.2 Refining the Skills Factor Equation

In Chapter 4, Section 4.7.1 the equation for the skills factor was defined to be

$$f_1 = {}^1/_7 (e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7)$$

where:

f_1 = skills factor

e_1 = organisational skills element

e_2 = asset management skills element

e_3 = administration skills element

e_4 = analytical skills element

e_5 = communication skills element

e_6 = social skills element

e_7 = political skills element

When the weights listed in Table 5.6 were incorporated into this equation, the expression

$$e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7$$

became:

$$4.5e_1 + e_2 + 6e_3 + 7e_4 + 2.5e_5 + 4.5e_6 + 2.5e_7$$

The revised coefficients changed the range of possible values for this expression from 0 to 7 a range of 0 to 28. Therefore, it was necessary to divide the expression

by 28 to return the deficiency measurement for the skills factor to a range of 0 to 1. The skills factor equation then became:

$$f_1 = {}^1\!/_{28} \ (4.5e_1 + e_2 + 6e_3 + 7e_4 + 2.5e_5 + 4.5e_6 + 2.5e_7) \text{ or}$$

$$f_1 = 0.161\ e_1 + 0.036\ e_2 + 0.214\ e_3 + 0.250\ e_4 + 0.089\ e_5 + 0.161\ e_6 + 0.089\ e_7$$

The equation for management skills was changed to create a refined version of the model and a new solution was produced. The results are presented in Table 5.7 below. Throughout the remainder of this Chapter, the initial results referred to are taken from the pilot test results which were presented in Section 5.2, Table 5.1.

Table 5.7. Refinement 3 Results

	Respondent						
Skills Factor	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Initial Results	0.11	0.41	0.48	0.20	0.47	0.48	0.36
Refinement 3Results	0.15	0.38	0.45	0.22	0.45	0.38	0.34
Change	0.04	-0.03	-0.03	0.02	-0.02	-0.10	-0.02
Percentage Change (%)	36.4	-7.3	-6.3	10.0	-4.3	-20.8	-5.6
Individual Deficiency							
Refinement 2 Results	0.28	0.50	0.60	0.35	0.49	0.61	0.47
Refinement 3 Results	0.29	0.49	0.59	0.36	0.49	0.58	0.47
Change	0.01	-0.01	-0.01	0.01	0	-0.03	0
Percentage Change (%)	3.6	-2.0	0	2.9	0	-4.9	0

Changes in the level of deficiency in the skills factor ranged from a decrease of 20.8% to an increase of 36.4% although this latter result was from a low initial deficiency level. The average change was a decrease of 5.6%. For the six respondents, changes in the measurement of individual deficiency ranged from a decrease of 4.9% to an increase of 3.6% but there was no change in overall committee deficiency from this refinement to the model. However, the definition provided in Section 5.2 states that a solution is considered to be better if it successfully incorporates new information into the solution. The results indicated

that the refinement produced an improved solution to the measurement of deficiency in the skills factor for all respondents. Therefore, the solution was accepted as a better solution and the simulated annealing process was continued.

The results demonstrate that the refinement has effectively taken into account the relative importance of the skills elements to produce a better solution for the measurement of deficiency in this factor. Therefore the equation for the skills factor was changed from:

$$f_1 = {}^1/_7 (e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7) \quad \text{to}$$

$$f_1 = {}^1/_{28} (4.5e_1 + e_2 + 6e_3 + 7e_4 + 2.5e_5 + 4.5e_6 + 2.5e_7) \quad \text{or}$$

$$f_1 = 0.161\, e_1 + 0.036\, e_2 + 0.214\, e_3 + 0.250\, e_4 + 0.089\, e_5 + 0.161\, e_6 + 0.089\, e_7$$

where

f_1 = skills factor

e_1 = organisational skills element

e_2 = asset management skills element

e_3 = administration skills element

e_4 = analytical skills element

e_5 = communication skills element

e_6 = social skills element

e_7 = political skills element

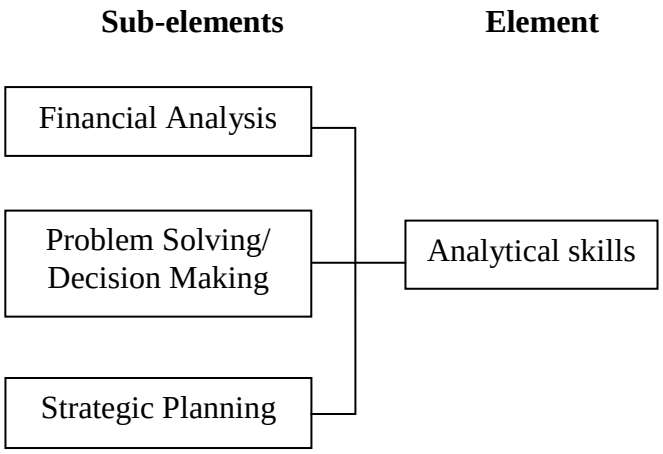
As there was no change in overall committee deficiency from the refinement, the new solution was not tracked at this stage of the simulated annealing process.

5.5 Refinement 4: Estimating the Coefficients in the Analytical Skills Equation

5.5.1 Determining Weights for the Analytical Skills Sub-Elements

The three sub-elements of analytical skills are: financial skills, problem solving/decision making and strategic planning. This structure is illustrated in Figure 5.3 below.

Figure 5.3. The Hierarchical Structure of the Analytical Skills Element



The objective for this section was to review the literature to investigate the relative importance of the contribution that each of these skills makes to the overall performance of the management committee and, if the contributions are found to be different, weight them accordingly.

Although there are a number of articles which investigate how decisions are made in specific areas of NPA management and fields of operation (Markham, Johnson & Bonjean 1998), no reference to studies which investigated the association between problem solving and decision making and management performance could be found in the literature. Mitrofanova (2005) claimed an effective decision making committee can strengthen a non-profit organisation in many different ways but did not support this with any research or references. Therefore decision making/problem solving was ranked last in order, behind the other two sub-elements.

There is a great deal of reference in the literature to the critical importance of financial control and the related areas of sustainability and the financial viability of the association. (Bhardwaj & Vuyyuri 2005, Brown 2005, Brown & Iverson 2004, Forbes 1998, Green & Griesinger 1996, Jackson & Holland 1998, Langabeer & Galeener 2007). Therefore, the financial skills sub-element was ranked above problem solving/decision making.

The remaining sub-element, strategic planning, receives as much attention in the literature as that given to financial skills. Many researchers have identified strategic planning and the committee's involvement in the planning process to be a critical success factor for an NPA. (Forbes 1998, Green & Griesinger 1996, Harrison & Sexton 2004, Langabeer & Galeener 2007, Taysir & Taysir 2012, Tucker 2010, Tucker & Parker 2013, Willems et al 2012). Therefore it was logical to give strategic planning a higher ranking than problem solving/decision making but it remained to be determined whether there is a difference in importance between financial skills and strategic planning. No conclusive evidence could be found in the literature to indicate that one competency is more important than the other. The evidence led to the conclusion that financial skills and strategic planning should be given equal ranking above problem solving/decision making.

Following the adopted approach, weights were allocated to the sub-elements in the reverse order of their ranking. The results are presented in Table 5.8 below.

Table 5.8. Ranking and Weights for the Analytical Skills Sub-Elements

Sub-Element	Ranking	Weight
Financial Skills	1 =	2.5
Strategic Planning	1 =	2.5
Problem Solving/ Decision Making	3	1

The weights allocated to the three sub-elements are revised estimates of their coefficients in the analytical skills equation.

5.5.2 Refining the Analytical Skills Equation

In Chapter 4, Section 4.7.1 the formula for the analytical skills element was defined to be:

$$e_4 = {}^1\!/_3 \ (s_1 + s_2 + s_3)$$

where

e_4 = analytical skills element, s_1 = financial analysis skills

s_2 = problem solving/decision making skills s_3 = strategic planning skills

and $0 \leq s_i \leq 1$ for i = 1,2 or 3

When the weights listed in Table 5.8 were incorporated into this equation, the expression

$$s_1 + s_2 + s_3$$

became: $2.5s_1 + s_2 + 2.5s_3$

The revised coefficients changed the range of possible values for this expression from 0 to 3 a range of 0 to 6. Therefore, it was necessary to divide the expression by 6 to return the deficiency measurement to a range of 0 to 1. The equation then became:

$$e_4 = {}^1\!/_6 \ (2.5s_1 + s_2 + 2.5s_3)$$

or $e_4 = 0.417\ s_1 + 0.167\ s_2 + 0.417\ s_3$

The equation for analytical skills was changed to create a refined version of the model and a new solution was produced. The results are presented in Table 5.9 below.

Table 5.9. Refinement 4 Results

	Respondent						
Analytical Skills	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Initial Results	0.04	0.32	0.21	0.17	0.42	0.22	0.23
Refinement 4 Results	0.05	0.40	0.23	0.21	0.43	0.22	0.26
Change	0.01	0.08	0.02	0.04	0.01	0	0.03
Percentage Change (%)	25.0	25.0	9.5	23.5	2.4	0	13.0
Individual Deficiency							
Refinement 3 Results	0.29	0.49	0.59	0.36	0.49	0.58	0.47
Refinement 4 Results	0.29	0.50	0.60	0.36	0.49	0.58	0.47
Change	0	0.01	0.01	0	0	0	0
Percentage Change (%)	0	2.0	1.7	0	0	0	0

The refinement to the analytical skills equation had only a minor affect on individual management deficiency ratios and produced no change in overall committee management deficiency. However, there were substantial changes in analytical skills deficiency for some of the respondents and an average change of 13% was recorded. The results demonstrate that the refinement has effectively taken into account the relative importance of the analytical skills sub-elements to produce a better solution to the measurement of deficiency in this element. Therefore, the new solution was accepted as a better solution as it incorporates additional information into the model and the equation for the analytical skills element was changed

from $e_4 = {}^1/_3 \ (s_1 + s_2 + s_3)$

to $e_4 = {}^1/_6 \ (2.5s_1 + s_2 + 2.5s_3)$

or $e_4 = 0.417\ s_1 + 0.167\ s_2 + 0.417\ s_3$

where

e_4 = analytical skills element, s_1 = financial analysis skills

s_2 = problem solving/decision making skills s_3 = strategic planning skills

and $0 \leq s_i \leq 1$ for i = 1,2 or 3

As there was no change in overall committee deficiency from this refinement to the model, the new solution was not tracked at this stage of the simulated annealing process.

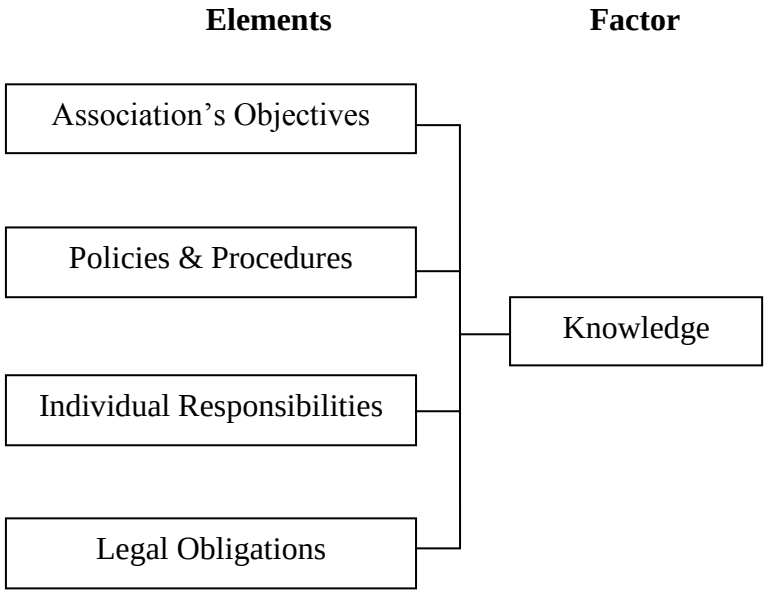
5.6 Refinement 5: Estimating the Coefficients in the Knowledge Factor Equation

5.6.1 Determining Weights for the Knowledge Factor Elements

The four elements of the knowledge factor are knowledge of the association's objectives, policies and procedures, individual responsibilities and legal obligations.

The hierarchical structure of the knowledge factor is illustrated in Figure 5.4 below.

Figure 5.4. The Hierarchical Structure of the Knowledge Factor



Following the adopted approach for estimating the coefficients of the independent variables, a search of the literature was undertaken to investigate the relative importance of the contribution that each of these areas of knowledge makes to the

overall performance of the management committee. If the investigation reveals that the contributions are different, the variables can be ranked accordingly and revised estimates of the coefficients obtained by reversing the rank order. Once again, the underlying assumption here is that the more important that an area of knowledge is to the performance of the committee, the more important will be deficiency in that area of knowledge. The review of the literature found substantial differences in the level of importance placed on each of the four areas of knowledge.

There is overwhelming support in the literature for achievement of the association's objectives to be the most important responsibility of the management committee and for committee members to have a clear understanding of these objectives (Bagnoli & Megali 2011, Epstein & McFarlan 2011, Forbes 1998, Herman & Renz 2002, Nicholson et al 2012, Sawhill & Williamson 2001). Therefore, knowledge of the association's objectives was given the highest ranking.

Several studies have identified role clarity or role ambiguity, which are directly related to knowledge of individual roles and responsibilities, as having an important impact on management performance (Doherty 2011, Doherty & Hoye 2011, Herman & Renz 2002, Widmer 1993, Wright & Millesen 2008). Therefore, knowledge of individual responsibilities was given second ranking.

There are several references in the literature to the importance of having proper management processes in place (Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Willems et al 2012). Management processes are directed by the association's policies and procedures. Therefore, it is reasonable to conclude that knowledge of these policies and procedures is equally as important as having them in place. For this reason, knowledge of policies and procedures was ranked third, behind knowledge of individual responsibilities.

The review of the literature found no references to studies which investigated the association between knowledge of legal obligations and management performance. For this reason, knowledge of legal obligations was ranked last. The ranking and weights of the four elements are displayed in Table 5.10 below.

Table 5.10. Ranking and Weights of the Knowledge Elements

Element	Ranking	Weight
Association's Objectives	1	4
Individual Responsibilities	2	3
Policies & Procedures	3	2
Legal Obligations	4	1

The weights allocated to the four elements are revised estimates of their coefficients in the knowledge equation.

5.6.2 Refining the Knowledge Factor Equation

In Chapter 4, Section 4.7.3 the equation for the knowledge factor was defined to be:

$$f_3 = {}^1/_4 \, (e_{10} + e_{11} + e_{12} + e_{13}) \qquad \text{where}$$

f_3 = knowledge factor

e_{10} = association objectives element

e_{11} = policies and procedures element

e_{12} = individual responsibilities element

e_{13} = legal obligations element

and $0 \leq e_i \leq 1$ for i = 10, 11, 12 or 13

When the weights listed in Table 5.10 were incorporated into this equation, the expression

$$e_{10} + e_{11} + e_{12} + e_{13}$$

became: $4e_{10} + 2e_{11} + 3e_{12} + e_{13}$

The revised coefficients changed the range of possible values for this expression from 0 to 4 a range of 0 to 10. Therefore, it was necessary to divide the expression by 10 to return the deficiency measurement to a range of 0 to 1. The equation then became:

$$f_3 = {}^1/_{10} \, (4e_{10} + 2e_{11} + 3e_{12} + e_{13})$$

or $f_3 = 0.4\, e_{10} + 0.3\, e_{11} + 0.2\, e_{12} + 0.1\, e_{13}$

The equation for measuring deficiency in the knowledge factor was changed to create a refined version of the model and a new solution was produced. The results are presented in Table 5.11 below.

Table 5.11. Refinement 5 Results

	Respondent						
Knowledge Factor	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Initial Results	0.06	0.53	0.28	0.28	0.44	0.78	0.40
Refinement 5 Results	0.03	0.65	0.28	0.33	0.35	0.80	0.40
Change	-0.03	0.12	0	0.05	-0.09	0.02	0
Percentage Change (%)	-50.0	22.6	0	17.9	-20.5	2.6	0
Individual Deficiency							
Refinement 4 Results	0.29	0.50	0.60	0.36	0.49	0.58	0.47
Refinement 5 Results	0.28	0.52	0.59	0.37	0.47	0.59	0.47
Change	-0.01	0.02	-0.01	0.01	-0.02	0.01	0
Percentage Change (%)	-3.4	4.0	-1.7	2.8	-4.1	1.7	0

The refinement to the knowledge equation had a small affect on individual management deficiency ratios with changes ranging from a decrease of 4.1% to an increase of 4.0%. There was no change in overall committee management deficiency nor was any change recorded for average deficiency in the knowledge factor. However, there were substantial changes in knowledge deficiency for some of the respondents. Overall, the results demonstrate that the refinement has effectively taken into account the relative importance of the knowledge elements. Therefore, the new solution was accepted as a better solution as it incorporates additional information into the model and the equation for the knowledge factor was changed:

from $f_3 = {}^1/_4 (e_{10} + e_{11} + e_{12} + e_{13})$

to $f_3 = {}^1/_{10} (4e_{10} + 2e_{11} + 3e_{12} + e_{13})$

or $f_3 = 0.4\, e_{10} + 0.3\, e_{11} + 0.2\, e_{12} + 0.1\, e_{13}$

where

f_3 = knowledge factor

e_{10} = association objectives element

e_{11} = policies and procedures element

e_{12} = individual responsibilities element

e_{13} = legal obligations element

and $0 \leq e_i \leq 1$ for i = 10, 11, 12 or 13

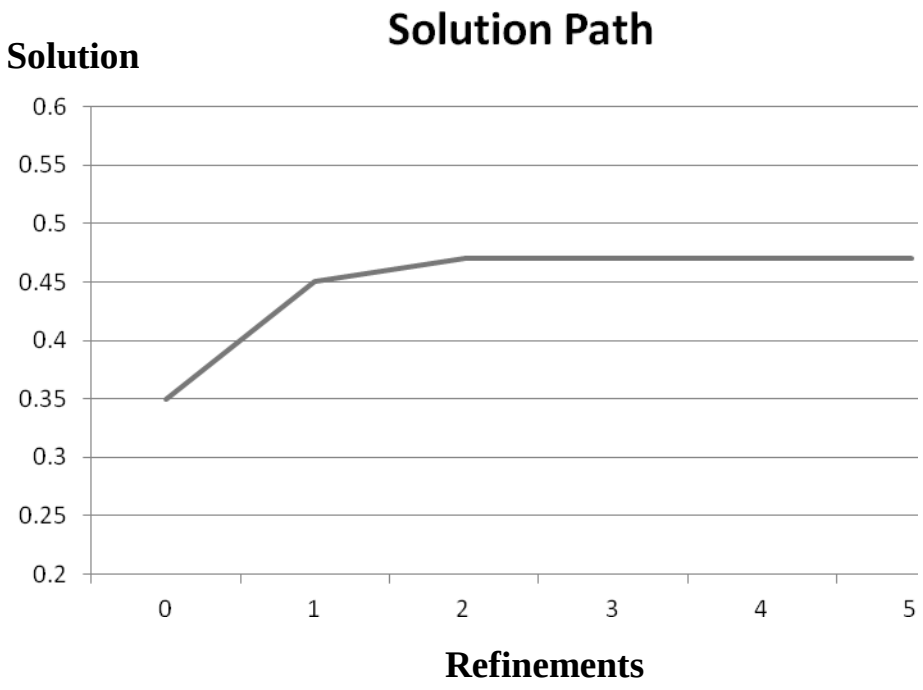
The solutions obtained from the first five refinements to the model are displayed in Table 5.12 below. The table shows the committee deficiency ratios which are the average of the individual deficiency ratios.

Table 5.12. Tracking New Solutions: Refinements 1 to 5

No.	Refinement Description	Committee Deficiency
	Initial Solution	0.35
1	Estimate Response Bias	0.45
2	Estimate Individual Deficiency Coefficients	0.47
3	Estimate Skills Coefficients	0.47
4	Estimate Analytical Skills Coefficients	0.47
5	Estimate Knowledge Coefficients	0.47

The data displayed in Table 5.12 is illustrated in Figure 5.5 below.

Figure 5.5. The Solution Path, Refinements 1 to 5

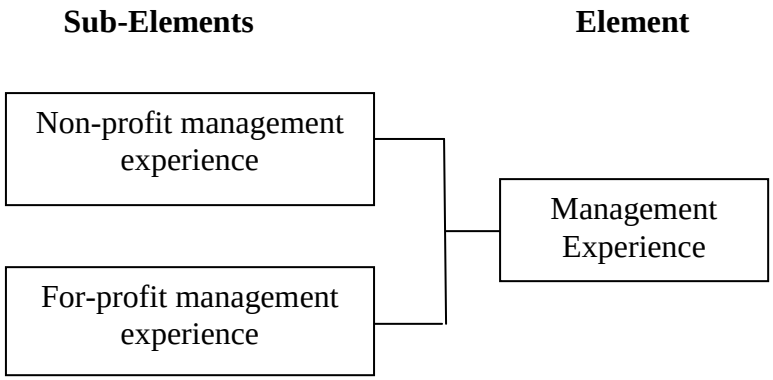


The chart illustrates that after refinements 1 through to 5 a clear solution path has emerged and the model appears to have reached an optimal state. However, it was found in the preceding sections that although refinements 3, 4 and 5 produced no change in overall committee deficiency, changes were noted in the level of deficiency for individual respondents which indicated that new information had been successfully incorporated into the model. Therefore the simulated annealing process was continued to test refinements to the experience equations and the committee management deficiency equation.

5.7 Refinement 6: Estimating the Coefficients in the Management Experience Equation

Management experience has two sub-elements: serving on the committee of a non-profit association which is referred to as non-profit management experience and working in a management position in a for-profit organisation which is referred to as for-profit management experience.
The hierarchical structure of the management experience element and its sub-elements is illustrated in Figure 5.6 below.

Figure 5.6. The Hierarchical Structure of the Management Experience Element



The two sub-elements of the management experience element will be referred to as the non-profit sub-element and the for-profit sub-element. Following the approach adopted in this chapter for revising the estimates of coefficients, the literature was searched for evidence that would allow the sub-elements to be ranked in order of importance.

It was noted in Section 5.4.1 that there is evidence in the literature that experience gained through years of service in a management role, both in the non-profit sector and in the for-profit sector, is positively associated with management performance (Brown 2007, Nafukho 2009, Schjoedt & Kraus 2009, Thach and Thompson 2007). It needs to be determined whether there is evidence to suggest a difference exists between the importance of non-profit management experience and for-profit management experience.

In a study investigating the importance of intellectual capital to an NPA, Nafukho (2009) found that experience gained through years of service in a management committee role had a positive association with management performance. This finding supports the more general view of the importance of management experience but it does not imply that non-profit experience is more important than for-profit experience. In another study, Schjoedt & Kraus (2009) found that time spent in the current committee role is more important than time spent performing a similar function in a for-profit organisation as the initial benefit derived from for-profit management experience diminishes as experience in the current role increases. However, their research did not identify the point at which years of experience in an NPA management role becomes more important than experience gained in a for-profit management role.

According to Thach and Thompson (2007) there is a similarity in the dimensions of leadership in the non-profit and for-profit sectors. They note that the findings from for-profit leadership research are often used to define management performance in the non-profit sector and claim that this situation is due to the substantial overlap in the main competencies required for sound leadership in both sectors. It follows that experience in a for-profit management role would be important experience for an NPA committee member.

As there is no clear evidence to suggest that non-profit management experience is more important than for-profit management experience, the two sub-elements were given an equal rank of 1. This conclusion implies the independent variables in the management experience equation are equal in weight. Therefore the coefficients were unchanged from the initial estimate of 1made in Chapter 4, Section 4.7.2, and the equation for the management experience element is

$$e_8 = {}^1/_2 \ (s_4 + s_5)$$

or $$e_8 = 0.5\ s_4 + 0.5\ s_5$$

where

e_8 = management experience element s_4 = non-profit sub-element

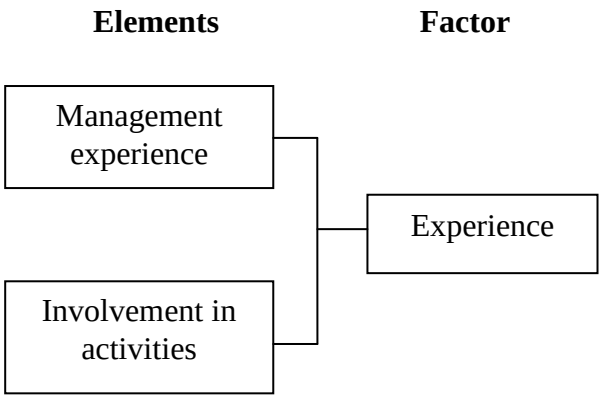
s_5 = for-profit sub-element and $0 \leq s_i \leq 1$ for $i = 4$ or 5

5.8 Refinement 7: Estimating the Coefficients in the Experience Factor Equation

5.8.1 Determining Weights for the Experience Factor Elements

The experience factor has two elements, management experience and involvement in activities. The hierarchical structure of the experience factor is illustrated in Figure 5.7 below.

Figure 5.7. The Hierarchical Structure of the Experience Element



Following the same process as that used in earlier sections, the objective was to investigate the relative importance of the contribution that each of the elements makes to the overall performance of the management committee and, if the investigation reveals that the contributions are different, weight them accordingly.

It was noted in Section 5.3.1 that there is evidence in the literature that experience gained through years of service in a management role, both in the non-profit sector and in the for-profit sector, is positively associated with management performance (Nafukho 2009, Schjoedt & Kraus 2009, Thach and Thompson 2007).

Langabeer and Galeener (2007) found that a high level of committee involvement and participation is positively related to improved committee performance. However, they were not making specific reference to involvement and participation in the events and activities organised by the association but were making a more broad statement concerning involvement in all of the processes in which a committee may be involved. Based on this finding, it is reasonable to assume that committee members who have been directly involved in organising or participating in events and activities have a higher level of experience in that area than those who have not been involved. However, as this assumption is anecdotal, more weight was given to the findings in the literature that support the importance of management experience and that element was ranked above the involvement in activities element. The ranking and weights of the two elements are displayed in Table 5.13 below.

Table 5.13. Ranking and Weights of the Experience Elements

Element	Ranking	Weight
Management Experience	1	2
Involvement in Activities	2	1

The weights allocated to the two sub-elements are revised estimates of their coefficients in the experience equation.

5.8.2 Refining the Experience Factor Equation

In Chapter 4, Section 4.7.2 the equation for calculating deficiency in the experience factor was defined to be

$$f_2 = {}^1\!/_2 \, (e_8 + e_9)$$

where

f_2 = experience factor e_8 = management role element

e_9 = activities element

When the weights listed in Table 5.13 were incorporated into this equation, the expression

$$e_8 + e_9$$

became $2e_8 + e_9$

The revised coefficients changed the range of possible values for this expression from 0 to 2 a range of 0 to 3. Therefore, it was necessary to divide the expression by 3 to return the deficiency measurement to a range of 0 to 1. The equation then became

$$f_2 = {}^1/_3 \ (2e_8 + e_9)$$

or $f_2 = 0.667\ e_8 + 0.333\ e_9$

The equation for measuring deficiency in the knowledge factor was changed to create a refined version of the model and a new solution was produced. The results are presented in Table 5.14 below.

Table 5.14. Refinement 7 Results

	Respondent						
Experience Factor	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Initial Results	0.25	0.50	0.75	0.25	0.38	0.75	0.48
Refinement 7 Results	0.25	0.50	0.67	0.17	0.42	0.83	0.47
Change	0	0	-0.08	-0.08	0.04	0.08	-0.01
Percentage Change (%)	0	0	-10.7	-32.0	10.5	10.7	-2.1
Individual Deficiency							
Refinement 6 Results	0.28	0.52	0.59	0.37	0.47	0.59	0.47
Refinement 7 Results	0.28	0.52	0.57	0.34	0.48	0.60	0.47
Change	0	-0	-0.02	-0.03	0.01	0.01	0
Percentage Change (%)	0	0	-3.4	-8.1	2.1	1.7	0

The refinement to the experience equation had a small affect on individual management deficiency ratios with changes ranging from a decrease of 8.1% to an increase of 2.1%. The refinement produced no change in overall committee management deficiency. However, there were substantial changes in experience deficiency for some of the respondents and an average decrease of 2.1% was recorded. The results demonstrate that the refinement has effectively taken into account the relative importance of the experience elements to produce a new solution to the measurement of deficiency in this element. Therefore, the new solution was accepted as a better solution as it incorporates additional information into the model and the equation for the experience element was changed from:

$$f_2 = {}^1/_2 \, (e_8 + e_9)$$

to $$f_2 = {}^1/_3 \, (2e_8 + e_9)$$

or $$f_2 = 0.667\, e_8 + 0.333\, e_9$$

where

f_2 = experience factor e_8 = management experience element

e_9 = activities element

There was no change in overall committee deficiency from this refinement to the model. However, the definition provided in Section 5.2 states that a solution is considered to be better if it successfully incorporates new information into the solution. The results indicated that the refinement produced an improved solution to the measurement of deficiency in the experience factor for most respondents. Therefore, the solution was accepted as a better solution and the simulated annealing process was continued to investigate whether a refinement of the committee management deficiency equation was possible.

5.9 Estimating the Coefficients in the Committee Management Deficiency Equation

In Chapter 4, Section 4.7.5 the formula for committee management deficiency was defined to be the average of the individual deficiency measurements. That is:

$$D = {}^1/_n \sum_{i=1}^{n} d_i$$

where

D = committee management deficiency

d = individual management deficiency

n = number of individuals

This definition assumes that, for a given management team, all committee members responding to the survey are equally important in determining that committee's level of management deficiency which led to the assumption that the coefficients of the independent variables, d_i, are 1.

The review of the literature found no references to any study which examined the relative importance of individual committee members to overall committee performance. Therefore, in the absence of any evidence to support a different view, the initial assumption that all committee members are of equal importance to the team's management performance was not altered and the coefficients of the independent variables were not changed from 1. The equation for measuring committee management deficiency remained the average of the individual deficiency measurements. That is

$$D = {}^{1}/_{n} \sum_{i=1}^{n} d_i$$

5.10 Tracking New Solutions: Refinements 1 to 7

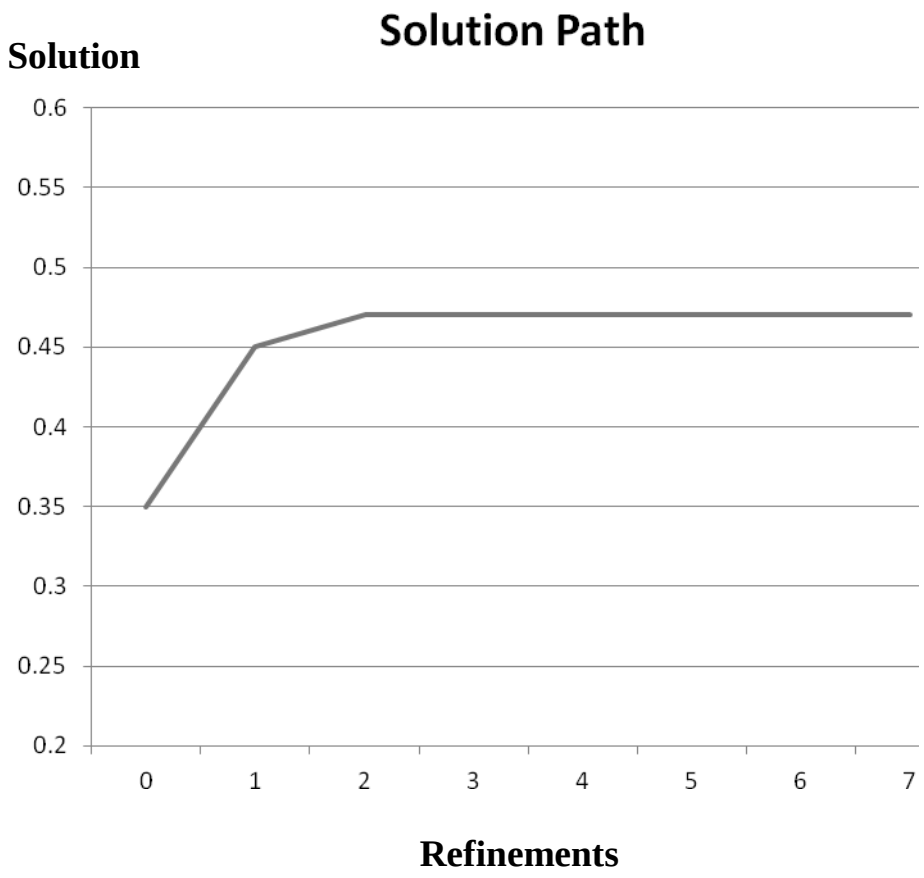
The solutions obtained from the seven refinements to the model are displayed in Table 5.15 below. The table shows the committee deficiency ratios which are the average of the individual deficiency ratios.

Table 5.15. Tracking New Solutions: Refinements 1 to 7

No.	Refinement Description	Committee Deficiency
	Initial Solution	0.35
1	Estimate Response Bias	0.45
2	Estimate Individual Deficiency Coefficients	0.47
3	Estimate Skills Coefficients	0.47
4	Estimate Analytical Skills Coefficients	0.47
5	Estimate Knowledge Coefficients	0.47
6	Estimate Management Experience Coefficients	0.47
7	Estimate Experience Coefficients	0.47

The data displayed in Table 5.15 is illustrated in Figure 5.8 below.

Figure 5.8. The Solution Path, Refinements 1 to 7



The chart clearly illustrates that the model has reached an optimal state.

5.11 Tracking Refinements Using Data from a Second NPA

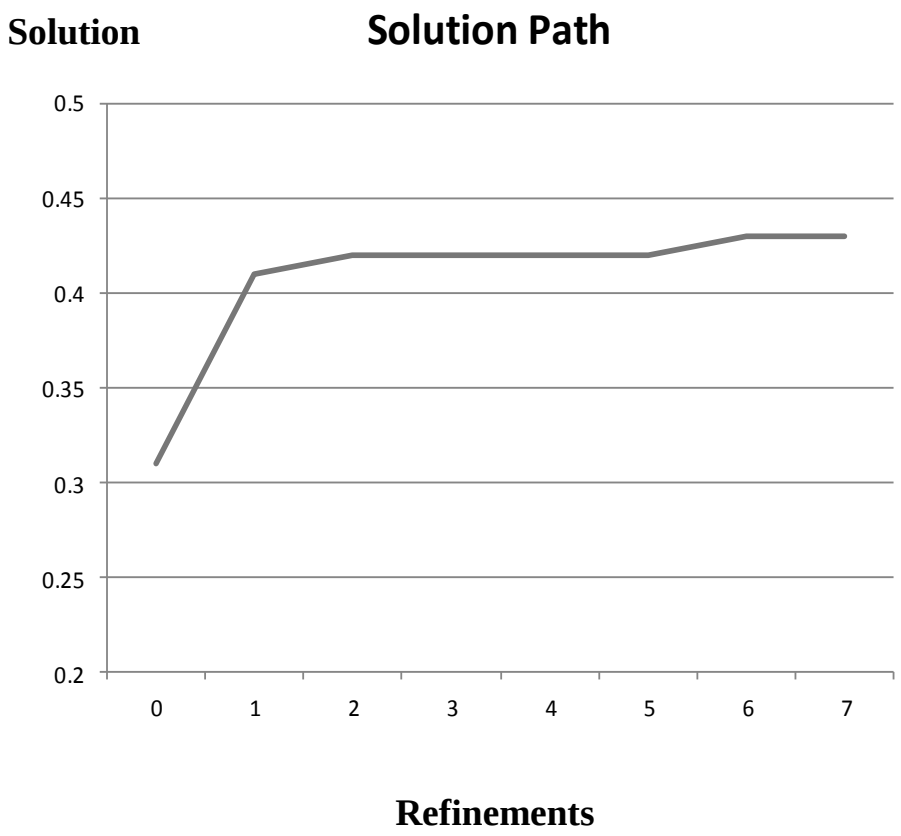
In the pilot test of the postal survey and the initial form of the model, two complete sets of data were collected. The data from the first NPA was used in the previous sections to refine the model. The data from the second NPA involved in the pilot test was processed through the same sequence of refinements made to the model. The solutions obtained for committee management deficiency are displayed in Table 5.16 below.

Table 5.16. Tracking New Solutions: Refinements 1 to 7, Second NPA

No.	Refinement Description	Committee Deficiency
	Initial Solution	0.31
1	Estimate Response Bias	0.41
2	Estimate Individual Deficiency Coefficients	0.42
3	Estimate Skills Coefficients	0.42
4	Estimate Analytical Skills Coefficients	0.42
5	Estimate Knowledge Coefficients	0.42
6	Estimate Management Experience Coefficients	0.43
7	Estimate Experience Coefficients	0.43

The data displayed in Table 5.16 is illustrated in Figure 5.9 below.

Figure 5.9. The Solution Path, Refinements 1 to 7, Second NPA



For the data collected from the second NPA involved in the pilot test, tracking the solution path for refinements 1 through to 7 indicates that refinement 6 moved the solutions to a new path then the model reached an optimal state. This result provides further evidence that the simulated annealing methodology used to develop and refine the heuristic model has successfully produced the optimal state of the model.

5.12 The Refined Heuristic Model

The simulated annealing process followed to carry out refinements to the heuristic model drew on information found in the literature that enabled the coefficients of the independent variables to be estimated by taking into account the relative importance of each variable in determining the value of the associated dependent variable. The set of equations which form the refined model are summarised below:

$$D = {}^{1}/_{n} \sum_{i=1}^{n} d_i$$

where

D = committee management deficiency
d = individual management deficiency
n = number of individuals

$$d = 0.1 + 0.286\, f_1 + 0.238\, f_2 + 0.167\, f_3 + 0.167\, f_4 + 0.071\, f_5 + 0.071\, f_6$$

where
f_1 = skills factor f_2 = experience factor f_3 = knowledge factor
f_4 = commitment factor f_5 = resistance to change factor f_6 = age factor

$$f_1 = 0.161\, e_1 + 0.036\, e_2 + 0.214\, e_3 + 0.250\, e_4 + 0.089\, e_5 + 0.161\, e_6 + 0.089\, e_7$$

where
e_1 = organisational skills element e_2 = asset management skills element
e_3 = administration skills element e_4 = analytical skills element
e_5 = communication skills element e_6 = social skills element
e_7 = political skills element

$$e_4 = 0.417\, s_1 + 0.167\, s_2 + 0.417\, s_3$$

where
s_1 = financial analysis skills s_2 = problem solving/decision making
s_3 = strategic planning skills

$$f_2 = 0.667\, e_8 + 0.333\, e_9$$

where
e_8 = management experience element e_9 = activities element

$$e_8 = 0.5\, s_4 + 0.5\, s_5$$

where
s_4 = non-profit management experience s_5 = for-profit management experience

$$f_3 = 0.4\, e_{10} + 0.3\, e_{11} + 0.2\, e_{12} + 0.1\, e_{13}$$

where
e_{10} = association objectives element e_{11} = policies and procedures element
e_{12} = individual responsibilities element e_{13} = legal obligations element

5.13 Results Obtained from the Refined Model

To illustrate the output produced by the refined model, the results obtained in the pilot test from the NPA with six respondents are displayed in Table 5.17 below.

Table 5.17. Results Produced by the Refined Model

	Respondent Deficiency Ratios						
	1	**2**	**3**	**4**	**5**	**6**	**Average**
Age	**0.50**	**0**	**0.75**	**0.25**	**0.25**	**0.25**	**0.33**
Resistance to Change	**0.17**	**0.33**	**0.42**	**0.17**	**0.33**	**0.08**	**0.25**
Commitment	**0.17**	**0.33**	**0.33**	**0.33**	**0.33**	**0.25**	**0.29**
Financial Skills	0	0.58	0.50	0	0.50	0.42	0.33
Problems/Decisions	0	0	0.13	0	0.38	0.25	0.13
Strategic Planning	0.13	0.38	0	0.50	0.38	0	0.23
Analytical Skills	0.05	0.40	0.23	0.21	0.43	0.22	0.26
Asset Management	0	0.25	0.50	0	0.50	0.75	0.33
Administration Skills	0.46	0.29	0.79	0.25	0.63	0.38	0.47
Organisational Skills	0.13	0.25	0.13	0.38	0.25	0.38	0.25
Communication Skills	0	0.63	0.25	0.25	0.25	0.50	0.31
Social Skills	0.13	0.38	0.50	0.13	0.25	0.13	0.25
Political Skills	0	0.75	1	0.25	1	1	0.67
Skills	**0.15**	**0.39**	**0.45**	**0.23**	**0.45**	**0.37**	**0.34**
Management Experience	0.25	0.50	0.50	0	0.50	1	0.46
Activities Involvement	0.25	0.50	1	0.50	0.25	0.50	0.50
Experience	**0.25**	**0.50**	**0.67**	**0.17**	**0.42**	**0.83**	**0.47**
Objectives	0	1	0.50	0.50	0	0.75	0.46
Policies & Procedures	0	0.38	0.13	0.13	0.75	0.63	0.33
Legal Obligations	0.25	0.25	0.50	0.25	0.50	0.75	0.42
Individual Responsibilities	0	0.50	0	0.25	0.50	1	0.38
Knowledge	**0.03**	**0.65**	**0.28**	**0.33**	**0.35**	**0.80**	**0.40**
Individual Deficiency*	**0.28**	**0.52**	**0.57**	**0.34**	**0.48**	**0.60**	
Committee Deficiency*	*Includes an estimate of 0.1 for response bias						**0.47**

The refined model produced individual management deficiency measurements that ranged from 28% to 60%. Average factor deficiency measurements ranged from 25% for the resistance to change factor to 47% for the experience factor. The committee deficiency measurement changed from 35% deficiency produced by the initial form of the model to 47% deficiency produced by the refined model. These results are meaningful and acceptable both in terms of their absolute value and range. They also represent a better solution than the one obtained from the initial form of the model because the refinements incorporate new information into the model by taking into account estimated response bias and the relative importance of the independent variables in determining the value of the dependent variables in the model's set of equations.

5.14 Conclusion

This chapter documented the application of the simulated annealing methodology to carry out a series of refinements to the heuristic model. The new solutions obtained were tracked and a clear solution path emerged indicating that the model had reached its optimal state. Pilot test data processed by the refined model produced results that were meaningful and acceptable.

The next chapter covers the development of a technique to validate the results obtained from the refined model and establishes that there is an alignment of the results produced by the model with those produced by an alternate method.

Chapter 6. Validating the Solution Produced by the Heuristic Model

6.1 Introduction

Chapter 5 documented the simulated annealing model development process which was followed to carry out refinements to the set of equations that form the heuristic model. The refinements were tested using data collected from the two NPAs involved in the pilot test. The solutions produced by each refinement were tracked and a clear solution path emerged which indicated that the model had reached its optimal state. It was found that the refined model produced a meaningful and acceptable solution to the measurement of individual management deficiency. However, the results produced by the model have not been validated nor has any statistical analysis been performed to indicate what level of confidence can be place on the reliability of the estimated solution.

It was stated in Chapter 1, Section 1.5, that in order to demonstrate that the heuristic model produced an acceptable, approximate solution to the measurement of individual management deficiency, it was necessary to validate the findings from the model by establishing that there was an alignment of the model results with an assessment of individual management deficiency obtained by an alternate method. This chapter covers the development of the alternate method and its application to the pilot test data. The results obtained from the model and the alternate method were subjected to three different statistical analyses to determine whether there was an alignment of the results.

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6.2 The Alternate Method for Measuring Individual Management Deficiency

There is no established technique for validating the results produced by the heuristic model developed in this study as this project is a new field for the application of simulated annealing methodology. Therefore, a new method had to be developed to provide an alternate measurement of individual management deficiency which could be used to validate the solution derived from the model.

6.2.1 Description of the Alternate Method

The alternate method developed for measuring individual management deficiency was based on rating individual management performance. The data used for the model validation process was collected from six committee members of the NPA in the pilot test. For the non-parametric statistical analysis applied to the data, a sample size of six is considered to be acceptable.

After the six committee members who comprise the sample had completed and returned the survey, an individual, face-to-face interview was arranged with each respondent. Each individual was asked to rate the overall management performance of the other committee members and themselves on an 11 point

Likert-type scale ranging from 0 to 10 where 0 represented “extremely poor performance in all areas” and 10 represented “extremely good performance in all areas”. An 11 point scale was chosen because rating an individual’s performance using a scale of 0 to 10 is a common experience for many people, particularly for those using telephone technical support services and those responding to on-line surveys seeking feedback on a customer’s experiences in dealing with an organisation.

For each committee member an average management performance rating was calculated from the individual ratings. The average performance ratings were converted into deficiency ratios by dividing the average performance ratings by 10 and subtracting the result from 1. This process is illustrated below:

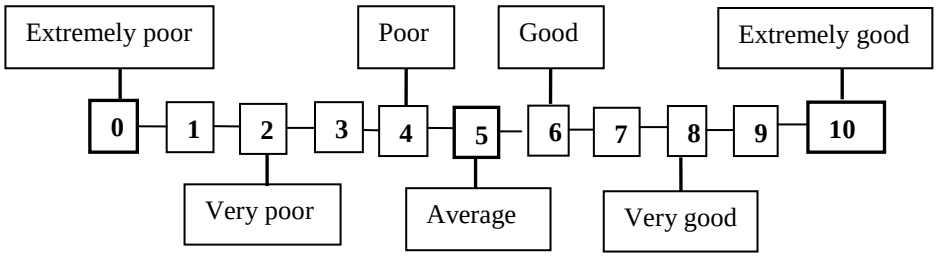
$$\text{Ratings deficiency ratio} = 1 - (\text{average performance rating} \div 10)$$

For example, if a respondent received an average performance rating of 6.25, their ratings deficiency ratio would given by:

$$\text{Ratings deficiency ratio} = 1 - (6.25 \div 10)$$
$$= 1 - 0.625$$
$$= 0.375 \text{ or } 37.5\%$$

The 11 point Likert-type scale used to collect the ratings data is illustrated in Figure 6.1 below:

Figure 6.1. The Individual Performance Rating Scale



6.2.2 Results Obtained from the Sample

Two sets of results were obtained from the six respondents who made up the sample used in the model validation process. Their responses to the survey were entered into the model using the data processing spreadsheet which produced an individual management deficiency ratio for each respondent. These deficiency ratios are referred to as model deficiency ratios. Their responses to the individual performance ratings produced an alternate measurement of individual management deficiency for each respondent following the process outlined in Section 6.2.1 above. These deficiency ratios are referred to as ratings deficiency ratios.

The model deficiency ratios and their rank order are displayed in Table 6.1 below. These results were taken from Table 5.17 in Chapter 5, Section 5.13.

Table 6.1. Model Deficiency Ratios and Rank Order

Respondent	Model Deficiency Ratio	Rank
1	0.28	6
2	0.52	3
3	0.57	2
4	0.34	5
5	0.48	4
6	0.60	1
Mean:	0.47	

The results from the individual performance ratings are displayed in Table 6.2 below. For each of the six committee members, the table shows the performance rating they gave to each of their fellow committee members and themselves.

Table 6.2. Performance Ratings, Ratings Deficiency Ratios and Rank Order

	Committee Members							Average Rating	Deficiency Ratio	Rank
	1	**2**	**3**	**4**	**5**	**6**	**Total**			
1	8	5	3	7	7	5	35	5.83	0.42	3.5
2	7	6	5	7	7	4	36	6.00	0.40	5
3	4	2	3	7	4	1	21	3.50	0.65	1
4	7	7	8	8	8	5	43	7.17	0.28	6
5	6	6	6	6	6	5	35	5.83	0.42	3.5
6	5	5	4	5	5	4	28	4.67	0.53	2
								Mean:	0.45	

A summary of the two sets of results obtained from the sample is provided in Table 6.3 below.

Table 6.3. Model and Ratings Deficiency Ratios

	Respondent						
	1	**2**	**3**	**4**	**5**	**6**	**Mean**
Model deficiency ratio	0.28	0.52	0.57	0.34	0.48	0.60	0.47
Ratings deficiency ratio	0.42	0.40	0.65	0.28	0.42	0.53	0.45

6.3 Statistical Analysis of the Sample Results

To validate the solution produced by the model, the individual deficiency ratios obtained from the model and those obtained from committee members' ratings were subjected to three forms of statistical analysis which are presented in the following sections. The t-test was used to test the significance of the difference between mean of the model deficiency ratios and the mean of the ratings deficiency ratios. As the sample size is small for the reliable application of the t-test, non-parametric analysis would be more appropriate. Two types of non-parametric statistical analysis were applied to the data. Firstly, the non-parametric version of the Spearman rank correlation coefficient was calculated to assess the relationship between the paired observations formed by the model deficiency ratios and the ratings deficiency ratios. Secondly, the non-parametric sign test was used to test the significance of the difference between the mean of the model deficiency ratios and the ratings deficiency ratios.

6.3.1 T-test

The t-test was used to test the significance of the difference between the mean of the model deficiency ratios and the mean of the ratings deficiency ratios. The null hypothesis was: there is no significant difference between the two means. That is, $\mu_1 = \mu_2$ where μ_1 is the mean of the model deficiency ratios and μ_2 is the mean of the ratings deficiency ratios. The application of the t-test to the data is presented below.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

$d_0 = \mu_1 - \mu_2$ so $d_0 = 0$

Select a 95% confidence level. That is $\alpha = 0.05$

Critical region for $\alpha = 0.05$ and n=6 is: $t < -2.015$ and $t > 2.015$ where

$t = (\bar{D} - d_0) / (S_d / \sqrt{n})$ with v = 5 degrees of freedom and $d_0 = 0$

$s_d^2 = (n \sum d_i^2 - (\sum d_i)^2) / (n (n-1))$

$\bar{D} = (\sum d_i) / n$

Table 6.4 contains the preliminary computations required for the t-test.

Table 6.4. Preliminary Computations for the T-test

Respondent	Model	Ratings	d_i	d_i^2
1	0.28	0.42	-0.14	0.020
2	0.52	0.40	0.12	0.014
3	0.57	0.65	-0.08	0.006
4	0.34	0.28	0.06	0.004
5	0.48	0.42	0.06	0.004
6	0.60	0.53	0.07	0.005
		Summations:	0.09	0.053

$\bar{D} = \sum d_i / n = 0.09 / 6 = 0.015$

$s_d^2 = (n \sum d_i^2 - (\sum d_i)^2) / (n (n-1)) = ((6)(0.053) - (0.09)^2) / (6)(5)$

$= (0.318 - 0.008) / 30$

$= 0.010$

$s_d = \sqrt{0.010} = 0.10$

Then $t = (\bar{D} - d_0) / (S_d / \sqrt{n}) = (0.015 - 0) / (0.10 / \sqrt{6})$

$= (0.015) / 0.041$

$= 0.366$

Conclusion:

t = 0.366 is not in the critical region. Therefore accept H_0 and conclude that, at the 95% confidence level, there is no significant difference between the two means. This analysis indicates that there is an alignment of the results produced by the heuristic model and the measurement of deficiency derived from the performance ratings.

6.3.2 Spearman Rank Correlation Coefficient, Non-parametric Version

As the sample size is small (n=6) and the data is subjective in nature, it was appropriate to apply the non-parametric version of the Spearman rank correlation coefficient to the data. That is:

$$r_s = 1 - (6 \sum d_i^2) / (n (n^2 - 1))$$

where d_i are the differences between the rankings and n is the number of paired observations. The coefficient is calculated using the rank order of the two variables in the analysis. The preliminary computations required for the calculation of the coefficient are displayed in Table 6.5 below.

Table 6.5. Preliminary Computations for Spearman Rank Correlation Coefficient

Respondent	Model Ranking (x_i)	Ratings Ranking	d_i	d_i^2
1	6	3.5	2.5	6.25
2	3	5	-2	4
3	2	1	1	1
4	5	6	-1	1
5	4	3.5	0.5	0.25
6	1	2	-1	1
			Sum	13.50

$$r_s = 1 - (6 \sum d_i^2) / (n (n^2 - 1))$$

$$r_s = 1 - (6 (13.50)) / (6 (36-1))$$

$$= 1 - 81 / 210$$

$$= 1 - 0.386$$

$$\approx 0.6$$

A Spearman rank correlation coefficient of 0.6 indicates that a reasonably strong positive correlation exists between the measurements of management deficiency produced by the model and those derived from committee member ratings. This result is a further indication that there is an alignment of the deficiency ratios produced by the model and those produced by the alternate method.

6.3.3 The Sign Test

The sign test is a non-parametric statistical analysis which is appropriate to use with a small sample size and subjective data. In this instance, the test was used to assess whether the population of model deficiency ratios and the population of ratings deficiency ratios are symmetric which would imply that there is no

significant difference between the mean of the model deficiency ratios and the mean of the ratings deficiency ratios. The null hypothesis was: there is no significant difference between the two means. That is, $\mu_1 = \mu_2$ where μ_1 is the mean of the model deficiency ratios and μ_2 is the mean of the ratings deficiency ratios. Table 6.6 below displays the preliminary computations required for the sign test. The column labelled

d_i shows the sign of the difference between the two ratios.

Table 6.6. Preliminary Computations for the Sign Test.

Respondent	**Model Deficiency Ratio**	**Rating Deficiency Ratio**	d_i
1	0.28	0.42	-
2	0.52	0.40	+
3	0.57	0.65	-
4	0.34	0.28	+
5	0.48	0.42	+
6	0.60	0.53	+
Means	μ_1 = 0.47	μ_2 = 0.45	

n = 6

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

Let R = 1

For R < 1, $\alpha = 2P (R < r^* | H_o$ is true)

= 2 (0.016)

= 0.032

$\alpha = 0.032$ corresponds to approximately to a 97% confidence level.

Critical region: R <1

Computations: $r_+ = 4$, $r_- = 2$ so r = 2 (the smaller of r_+ and r_-)

Conclusion: Do not reject H_0 and conclude that there is no significant difference between the two means.

Together, the Spearman rank correlation coefficient and the sign test results indicated that the heuristic model produced measurements of individual management deficiency which were aligned with and not significantly different from the deficiency measurements derived from the performance ratings.

6.4 Summary of Statistical Analysis Results

In order to validate the solution produced by the heuristic model it was necessary to establish that there is an alignment of the model results with an assessment of individual management deficiency obtained by an alternate method. The alternate method developed was an individual performance rating scale.

Three different statistical analyses were carried out on the results obtained from the heuristic model and the results obtained from the performance ratings to determine whether there is an alignment of the results. The t-test and the non-parametric sign test indicated that there is no significant difference between the mean of the individual deficiency ratios produced by the model and the mean of the individual deficiency ratios produced by the performance ratings at the 95% and 97% confidence levels respectively. The non-parametric version of the Spearman rank correlation coefficient indicated a reasonably strong, positive correlation exists between the paired observations derived from the heuristic model and the individual performance ratings.

6.5 Conclusion

In this Chapter, an alternate method for measuring individual management deficiency was developed and applied to data obtained from the pilot test. Three different forms of statistical analyses were carried out on the results obtained from the heuristic model and those obtained from the performance rating method. Together, these results clearly established that an alignment exists between the results produced by the heuristic model and the results produced by the alternate method. Therefore, it is reasonable to make the following conclusions:

1. The results produced by the heuristic model have been validated.
2. The model does produce an acceptable, approximate solution to the measurement of individual management deficiency in non-profit associations.

The next chapter will document the collection and analysis of data from a large sample of NPA committee members which will enable further testing, refinement and validation of the model to be carried out.

Chapter 7. Data Collection

7.1 Introduction

Chapter 5 documented the process by which the heuristic model was refined and tested using data collected during a pilot study. The test indicated that the model does produce a meaningful and acceptable solution to the measurement of individual management deficiency in an NPA. Chapter 6 covered the validation of the solution produced by the model by establishing that there was an alignment of individual management deficiency ratios produced by the model and those produced by an alternate method. The successful validation of the solution led to the conclusion that the heuristic model does produce an acceptable, approximate solution to the measurement of individual management deficiency in an NPA. This chapter documents the process of collecting data from a sample of NPAs that will enable further refinement, testing and validation of the model to be carried out.

7.2 Selecting a Sample

7.2.1 The Population

The population for this study was defined in Chapter 1 to be art related associations incorporated through the Queensland Government's Office of Fair Trading. The names of associations in this population were sourced from the Office of Fair Trading on-line database. It was then necessary to access the postal address for each association. The access issue was addressed by using an internet search to find contact details for each association. The search found no activity for 25 associations. These associations were removed from the population. There was a further 22 associations for which a valid postal address could not be found. These associations were also removed from the population. The population was then defined to be non-profit associations incorporated with the Queensland Government's Office of Fair Trading having an art related field of interest and a valid postal address listed on an internet web page. Following this definition, the population was found to have 54 associations. The name and contact details of each member of this population were recorded in a database.

7.2.2 The Sample Unit

The sample unit comprised the four members of what is usually referred to as the executive committee: the president, secretary, treasurer and vice-president. In the State of Queensland the position of vice-president is optional but the model rules that are issued by the Office of Fair Trading and form part of the constitution of an incorporated association, make the appointment of members to the other three

positions compulsory. Members are elected to these positions at the association's annual general meeting.

7.2.3 The Sample Size

In determining the sample size a number of issues were taken into consideration. Firstly, individual management deficiency is a continuous variable. Therefore the sample size needed to be large enough to enable a reliable estimate of the population mean to be calculated. Secondly, the experience of past research studies suggests that a response rate of 45% to 50% can be expected unless administrative measures are taken to improve this rate. This level of response would be slightly below what is considered to be a satisfactory rate (University of Texas at Austin 2011) as it increases the possibility of an unacceptable level of non-response error. The administration process designed to increase the response rate for this study was presented in Chapter 3, Section 3.6.3. A pilot test of this process produced a response rate of 75%. Although this result was based on a small sample of 2 NPAs and 8 NPA committee members, it did indicate that the survey administration process would produce a satisfactory response rate. For the purpose of this study, a preferred set of responses from an NPA would be 3 or 4 returned, completed surveys from the 4 surveys sent to each NPA. The number of NPAs in the sample needed to be large enough to make it likely that at least 10 sets of 3 or 4 surveys would be returned as this would provide a sample of at least 30 committee members.

As the response rate of 75% achieved in the pilot test may not be a reliable indicator of the response that will be achieved from the sample, a more conservative estimate of a 60% response rate was made which means the probability that a survey will be returned is estimated to be 0.6. Therefore the probability of 3 or 4 surveys being returned from an association is given by:

$$\begin{aligned} P(3 \text{ or } 4) &= P(3) + P(4) \\ &= (0.6)^3 + (0.6)^4 \\ &= 0.3456 \end{aligned}$$

The expected number of associations returning 3 or 4 surveys is given by 0.3456 (n) where n is the sample size.

If 10 sets of 3 or 4 surveys are needed then

$$\begin{aligned} 10 &= 0.3456\ (n) \\ n &= 10 / 0.3456 \\ &= 28.9 \end{aligned}$$

Therefore, the survey needed to include at least 29 NPAs. A sample of this size or more was expected to provide adequate sets of data to investigate additional refinements to the model and carry out a more robust validation the model's results using the committee members' management performance ratings. A sample comprising 29 NPAs would send out 116 surveys with approximately 60 expected to be returned. This sample size is sufficient to produce a reliable statistical analysis of the data collected.

7.2.4 Sample Selection

To obtain a sample of at least 29 NPAs from a population of 54 NPAs, approximately three quarters of the population needed to be selected which is the same as saying one quarter of the population needed to be rejected. Therefore, sample selection was based on randomly rejecting one quarter of the population. To select the random sample the following steps were taken:

1. The associations were listed in alphabetical order and numbered from 1 to 54.
2. The list was divided into consecutive groups of 4.
3. An ordinary die was rolled until a number from 1 to 4 was obtained.
4. The association with this number was removed from the first group, retaining the other 3.
5. Counting from the association rejected from the first group, every 4^{th} association was removed.

This process provided a sample of 37 associations. Three of the associations in the sample had already been used in pilot studies to test the survey and the initial form of the model. Another association was in this researcher's local region and surveys for five committee members of that association were delivered and collected personally. The data collected from these four associations was combined with the data collected from the remaining 33 associations. Surveys sent to three associations were returned with an advice that the post office box in the address was closed. These associations were replaced with the closest available association in the alphabetical listing of associations. The surveys sent to two of the replacement associations were also returned with advice that the post office box was closed which left 31 associations involved in the postal survey.

7.3 Survey Administration

Data was collected from the sample of NPAs using a self-administered survey which was delivered to each association by post. Following the survey administration process outlined in Chapter3, Section 3.6.3 an initial contact letter was sent to the president of each association which advised that their association had been selected to participate in an important research project, provided a brief outline of the project and asked for their participation. A copy of the initial contact letter is provided in Appendix C. Two weeks after the initial contact letters were sent, the survey kits were posted. Each kit contained four surveys, folded into stamped, return addressed envelopes and individually marked for the president, secretary, treasurer and vice-president. A covering letter addressed to the president was also included which again provided a brief explanation of the research project and asked for their participation. The reward offered for participation, which was an analysis of the committee's management strengths and weaknesses, was also explained. A copy of this letter is also provided in Appendix C.

7.4 Data Screening

7.4.1 Control of Yea Sayer Response Bias

When completing a survey, some respondents deliberately set out to achieve the highest possible score. Their responses are motivated by achieving a high score rather than responding in an honest, truthful manner. This behaviour is thought to be a combination of social acceptance bias and acquiescence response bias (Paulhus 1991). In the study of survey response bias, such respondents are referred to as "yea sayers" which is derived from their tendency to respond to a question by agreeing or by saying "yes" regardless of whether that response is a truthful one or not. The responses of a yea sayer prevent the direct comparison of scores from one respondent to another. Further, when analysing the responses to a question the researcher is unable to distinguish between an extreme, yea sayer response and one that genuinely expresses a strong opinion. The recommended practice is to build some form of yea sayer screening into the survey. When detected, the yea sayer responses are removed from subsequent analysis (Paulhus 1991). To detect a yea sayer respondent, six control questions were built into the survey. The questions, together with their survey question numbers are listed below.

Question 18. A copy of the agenda for our committee meetings is always distributed a few days before each meeting.

Question 19. We have a comprehensive induction programme for new committee members in which we are all involved.

Question 20. Our policies and procedures are well documented and distributed to all committee members.

Question 21. How would you describe the programme your association has in place to improve the management skills of your committee?

Question 25. This committee avoids a lot of confusion and conflict by having good communication with the members.

Question 27. There is a sense of cohesion in our committee with everyone working well as a team and willing to help each other.

Each of these questions refers to a joint or shared responsibility of the committee. Therefore, for a given association, one would not expect to find a response which varied by a considerable amount from the average response to the question. For this set of six questions, surveys were screened to detect an individual whose responses were consistently at the extreme high end of the response scale and were at variance with the average response recorded by the other committee members from that association. When a yea sayer was detected by this method, that survey was removed from further analysis. An actual example of this screening process applied to the data collect from an NPA in the sample is provided in Table 7.1 below. In this example, respondent 1 is suspected of being a yea sayer,

Table 7.1. Analysis of Responses to the Yea Sayer Control Questions

	Respondent					Average Response for Respondents 2 to 5	Difference: Respondent 1 to the Average
Question	**1**	**2**	**3**	**4**	**5**		
18	5	4	2	3	5	3.5	1.5
19	5	4	2	5	5	4	1
20	5	2	1	3	5	2.75	2.25
21	5	2	1	1	4	2	3
25	5	2	2	1	3	2	3
27	5	2	2	1	3	2	3

The responses to the six control questions by respondent 1 are easily detected as being at the extreme high end of the 1 to 5 scale. The variation to average analysis shows a consistent positive variation to the average response made by the other four respondents. Therefore, the survey completed by respondent 1 was removed and not subjected to further analysis.

7.4.2 Control of Extreme Response Bias in Performance Ratings.

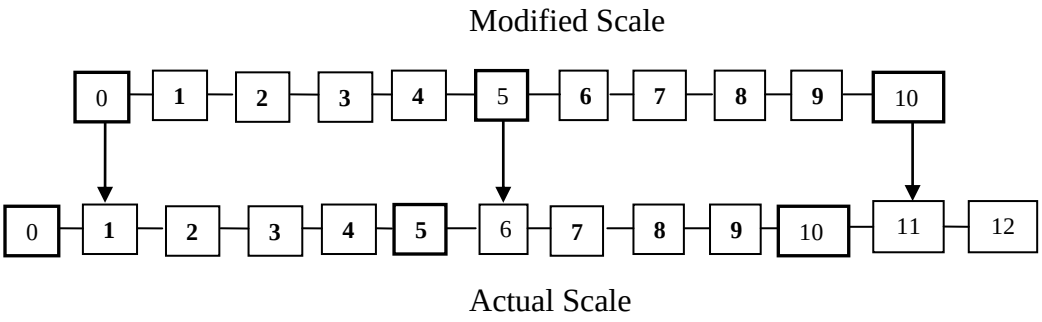
Extreme response bias occurs when a respondent is inclined to select a response from the extreme end of the scale (Paulhus 1991). It differs from yea sayer responses in that the individual is not agreeing with a statement or saying yes in response to a question but is consistently selecting the response at one of the extreme ends of the scale. The effects of extreme response bias on the analysis of the data are the same as those outlined for yea sayer response in the previous section. The recommend practice for controlling this form of bias follows a similar approach to that adopted for controlling yea sayer response bias. A respondent whose responses are consistently at the extreme end of the scale is identified and their responses are not subjected to further analysis (Paulhus 1991).

The individual performance ratings section of the postal survey asked respondents to rate the overall management performance of the other committee members and themselves on an 11 point Likert-type scale from 0 to 10 where 0 represents “extremely poor performance in all areas” and 10 represents “extremely good performance in all areas”. No responses at the extreme low end of the scale were recorded. Respondents who selected an extreme response of 10 for more than half of the respondents being rated were identified as exhibiting extreme response bias and their responses were removed and not subjected to further analysis.

7.4.3 Modifying the Performance Rating Scale.

The data collected and processed by the model during the pilot test indicated that the likelihood of an individual committee member being assessed to have a level of individual management deficiency of either 0 % deficiency or 100% deficiency is most unlikely. Therefore, to further reduce extreme response bias and improve the quality of the data collected, the effect of an extreme response at each end of the scale needed to be reduced. The approach adopted to achieve this correction is consistent with that recommended in the literature. Paulhus (1991) claimed that the validity of scores can be improved by adjusting the raw scores by an amount commensurate with estimated "contamination". As people are familiar with rating performance using a scale from 0 to 10 it was considered desirable to maintain a 0 to 10 rating scale in the survey. The problem of improving the validity of the scores by reducing the effect of extreme responses was solved by using an actual scale of 0 to 12 and considering the 0 to 10 scale presented to respondents to be a modified scale. The association between the two scales is illustrated in Figure 7.1 below.

Figure 7.1 The Association Between the Modified and Actual Scales



Responses made on the modified scale were converted to the actual scale by adding 1. For example, a response of 7 made on the modified scale would be converted into a response of 8. Responses made on the modified scale were converted into ratings deficiency ratios by first adding 1, then dividing by the maximum actual response of 12 to obtain a ratio. This ratio was subtracted from 1 to obtain a deficiency ratio. This process is illustrated below:

$$\text{Ratings Deficiency Ratio} = 1 - [(\text{modified response} + 1) \div 12)]$$

In the example above where the initial response was 7, the deficiency ratio would be calculated as follows:

$$\text{Ratings Deficiency Ratio} = 1 - [(7 + 1) \div 12)]$$
$$= 1 - 0.67$$
$$= 0.33$$

7.5 Survey Response Rate

From the sample of 31 associations, surveys were returned by 19 associations which is a response rate of 61%. A response rate above 50% is considered to be a good result (University of Texas at Austin 2011). From 19 associations the maximum number of surveys that could be returned is 76. The actual number of surveys returned was 49 which is a response rate of 64%. This is a high rate of return which reduces the possible effect of non-response bias in the results.

7.6 Conclusion

This chapter covered the data collection process used for this project. The population and the sample unit were defined and an estimated response rate was used to determine the number of NPAs to include in the postal survey. The process followed to select a random sample of NPAs was documented and the survey administration process was outlined. Screening techniques were developed to remove contaminated data. The survey response rate achieved was satisfactory indicating that the survey administration process successfully reduced non-response bias. Chapter 8 presents the results obtained from analysing the data collected from the postal survey.

Chapter 8. Data Analysis

8.1 Introduction

In the previous chapter the sampling process, the survey administration process and techniques for screening the data collected to remove contamination were presented. This chapter documents the analysis of the data collected from the postal survey which was combined with the data for three NPAs collected during the pilot study and an NPA contacted personally. This data was used to conduct a more robust investigation of the alignment of the individual management deficiency ratios produced by the heuristic model with those produced by the individual performance ratings method. The data also allowed further refinements of survey response bias to be carried out. The chapter concludes by presenting the findings from the analysis of the results produced by the heuristic model.

8.2 Validating the Results Produced by the Model

To validate the results produced by the model it needs to be established that there is an alignment of the results produced by the model and those produced by an alternate method. The validation process depends on statistical analysis clearly indicating that there is no significant difference between the mean of the deficiency ratios produced by the model and the mean of the deficiency ratios produced by the performance ratings method

For the management performance rating data to be useable, at least two surveys had to be returned from an NPA so that an average performance rating could be calculated for each committee member. Fifteen associations returned two or more surveys which provided a sample of 50 paired observations comprising a model deficiency ratio and the corresponding ratings deficiency ratio. In the analysis of these results, no adjustment to either set of data was made for response bias as it was assumed that, for each respondent, the level of response bias would be approximately equal for both sets of data. Two forms of statistical analysis were carried out. Firstly, the t-test was applied to the 50 paired observations to test the significance of the difference between the mean of the model deficiency ratios and the mean of the ratings deficiency ratios. Secondly, the sign test was applied to the average model deficiency ratios and the average ratings deficiency ratios that were calculated for each of the 15 NPAs. This test assesses whether the two populations are symmetric which would imply that there is no significant difference between their means.

8.2.1 T-test

The t-test was used to test the significance of the difference between the mean of the model deficiency ratios and the mean of the ratings deficiency ratios. For this test the data used was that collected from associations that returned two or more surveys which provided a sample of 50 paired observations. The data used for this

statistical analysis is displayed in Appendix D and the application of the t-test to this data is provided below.

Let μ_1 and μ_2 be the means of the model deficiency ratios and the ratings deficiency ratios respectively. The null hypothesis, $\mu_1 = \mu_2$, was tested at the 95% confidence level. If the null hypothesis is not rejected then it can be concluded that there is a no significant difference between the two means.

Let $\bar{X}_1$ be the sample mean of the model deficiency ratios and $\bar{X}_2$ be the sample mean of the ratings deficiency ratios.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

$\alpha = 0.05$

Critical region: $t < -1.960$ and $t > 1.960$ if $v > 29$

$t = [(\bar{X}_1 - \bar{X}_2) - d_o] / \sqrt{[(S_1^2/n_1) + (S_2^2/n_2)]}$

$d_0 = \mu_1 - \mu_2$ so $d_0 = 0$

and the degrees of freedom, v, is given by

$$v = [(S_1^2/n_1) + (S_2^2/n_2)]^2 / \{(S_1^2/n_1)^2/(n_1 - 1) + (S_2^2/n_2)^2/(n_2 - 1)\}$$

Computations:

$\bar{X}_1 = 0.337$ $\bar{X}_2 = 0.317$ $s_1^2 = 0.0167$ $s_2^2 = 0.0142$

$n_1 = 50$ $n_2 = 50$

$t = [(0.337 - 0.317) - 0] / \sqrt{[(0.0167 / 50) + (0.0142 / 50)]}$

$= 0.02 / 0.0217$

≈ 0.794

$v = [(0.0167 / 50) + (0.0142 / 50)]^2 / \{(0.0167/50)^2 / 49 + (0.0142/50)^2 / 49\}$

≈ 97

As $v > 29$ the critical region is : $t < -1.960$ and $t > 1.960$

The value, $t = 0.794$, does not lie in the critical region which means the null hypothesis is not rejected and one can conclude that there is no significant difference between the two means. Therefore, it can be claimed that the mean of the model deficiency ratios and the mean of the ratings deficiency ratios are estimates of the same population parameter. This result establishes that there is an alignment of the results produced by the heuristic model and the result produced by the performance ratings method.

8.2.2. The Sign Test

The statistical analysis carried out in the previous section was based on 50 paired observations. In this section the analysis carried out uses the average model deficiency ratios and the average rating deficiency ratios obtained for each of the

15 associations that returned two or more surveys. As the NPA sample size is small (n=15) and the data is subjective in nature, it would be appropriate to apply non-parametric analysis to the data. The sign test was used to assess whether the population of model deficiency ratios and the population of ratings deficiency ratios are symmetric.

The sign test was used to test the null hypothesis $\mu_1 = \mu_2$ against the alternative $\mu_1 \neq \mu_2$ where μ_1 is the mean of the model deficiency ratios and μ_2 is the mean of the ratings deficiency ratios. The data used for the sign test and the preliminary computations carried out are displayed in Table 8.1 below.

Table 8.1. Preliminary Computations for the Sign Test.

NPA Code	Average Model Deficiency Ratios	Average Rating Deficiency Ratios	Difference	Sign
ae	0.418	0.360	0.058	+
aj	0.345	0.333	0.012	+
aa	0.367	0.450	-0.083	-
az	0.275	0.278	-0.003	-
ba	0.385	0.266	0.119	+
bg	0.427	0.323	0.104	+
bi	0.384	0.222	0.162	+
ab	0.327	0.343	-0.016	-
bn	0.394	0.269	0.125	+
bo	0.313	0.243	0.071	+
bz	0.372	0.417	-0.045	-
ac	0.168	0.209	-0.041	-
cd	0.255	0.354	-0.099	-
cg	0.223	0.318	-0.095	-
cn	0.240	0.229	0.011	+

Computations for the sign test:

n = 15

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

Let r* = 4. (This vale was chosen as it yields a confidence level which is close to 95%)

r_+ is the number of + signs and r_- is the number of - signs

For R < 4, $\alpha = 2P (R < r^* | H_o \text{ is true})$

$= 2P (R < 4 | H_o \text{ is true})$

$= 2 (0.018)$

$= 0.036$

so the confidence level is approximately 96%.

Critical region: R < 4

Computations: $r_+ = 8$, $r_- = 7$ so r = 7 (the smaller of r_+ and r_-) which does not lie in the critical region.

Conclusion: Do not reject H_0 and conclude that the populations are symmetric and there is no significant difference between the two means.

The result from the sign test indicates that the mean of the model deficiency ratios and the mean of the ratings deficiency ratios are estimates of the same population parameter which implies that there is no significant difference between the means. A high level of confidence, in a statistical sense, can be placed on this result which further demonstrates that there is an alignment of the results produced by the heuristic model and the results derived from the individual performance ratings.

The statistical analyses carried out in Sections 8.2.1 and 8.2.2 effectively validate the results produced by the model. It can therefore be stated with a high level of confidence, in a statistical sense, that the heuristic model does produce an acceptable, approximate solution to the measurement of individual management deficiency in NPA committee members.

8.3 Refining the Estimate of Survey Response Bias

In Chapter 5, Section 5.2, a technique was presented which produced a refinement to the estimate of survey response bias using data collected during the pilot test. That estimate of 0.1 was derived from a sample of only six respondents. The postal survey produced a sample of 57 committee members. The data obtained from this sample was processed by the model and the results used to further refine the estimate of survey response bias.

The technique used for the first refinement was based on an underlying assumption that response bias was uniform across the factors which is clearly not the case. It is reasonable to assume that the data collected for age and years of management experience is objective in nature and would be free of the main sources of bias. Therefore a different method was developed which assumed there is no bias in the age and years of management experience responses. For this method it was again assumed that the population of individual deficiency measurements has a mean of 50% or 0.5 which means d = 0.5 in the equation below. Justification for this assumption was provided in Chapter 5, Section 5.2. It was also assumed that the level of response bias was uniform across the remaining four factors. In Chapter 5, Section 5.12, the refined equation for individual management deficiency was estimated to be:

$$d = 0.1 + 0.286\, f_1 + 0.238\, f_2 + 0.167\, f_3 + 0.167\, f_4 + 0.071\, f_5 + 0.071\, f_6$$

where d = individual management deficiency

f_1 = skills factor
f_2 = experience factor
f_3 = knowledge factor
f_4 = commitment factor
f_5 = resistance to change factor
f_6 = age factor

The constant term, 0.1, is the estimate of response bias derived from the first refinement. This term was removed and replaced by a bias variable, x, which was added to the skills, knowledge, commitment and resistance to change factors to give the equation shown below:

$$d = 0.286(f_1 + x) + 0.238\, f_2 + 0.167(f_3 + x) + 0.167(f_4 + x) + 0.071(f_5 + x) + 0.071\, f_6$$

When all of the data collected was processed by the heuristic model, 57 measurements of deficiency were obtained for each factor. From these results the average factor deficiency ratios were calculated. The results are displayed in Table 8.2 below. Note that no adjustment has been made for survey response bias in these results.

Table 8.2. Factor Average Deficiency Ratios

Factor Average Deficiency Ratio					
Age f_6	Resistance to Change f_5	Commitment f_4	Skills f_1	Experience f_2	Knowledge f_3
0.268	0.221	0.411	0.353	0.368	0.256

Substituting the average values for each factor into the above equation with d = 0.5, the following equation was obtained and solved for x:

$$0.5 = 0.286(0.353 + x) + 0.238(0.368) + 0.167(0.256 + x) + 0.167(0.411 + x) + 0.071(0.221 + x) + 0.071(0.268)$$

$$0.5 = 0.33465 + 0.691\,x$$

$$0.691\,x = 0.16535$$

$$x = 0.239$$

This method produced an estimate of 0.239 as the average level of response bias across the four factors: skills, knowledge, commitment and resistance to change. This value was substituted into the equation:

$$d = 0.286(f_1 + x) + 0.238\,f_2 + 0.167(f_3 + x) + 0.167(f_4 + x) + 0.071(f_5 + x) + 0.071\,f_6$$

which became:

$$d = 0.286(f_1 + 0.239) + 0.238\,f_2 + 0.167(f_3 + 0.239) + 0.167(f_4 + 0.239) + 0.071(f_5 + 0.239) + 0.071\,f_6$$

which simplifies to:

$$d = 0.165 + 0.286\,f_1 + 0.238\,f_2 + 0.167\,f_3 + 0.167\,f_4 + 0.071\,f_5 + 0.071\,f_6$$

The above equation, which defines the relationship between individual management deficiency and the factors, is the main component of the heuristic

model. The constant term, 0.165, represents the second refinement to the estimate of average survey response bias.

8.4 The Distribution of Individual Management Deficiency Ratios

The data collected from the postal survey provided 57 observations of individual management deficiency for committee members of smaller NPAs which allowed the distribution of these deficiency ratios to be investigated for the first time. The frequency distribution for this data is presented in Table 8.3 which uses a class interval of 0.05 and an estimate of 0.165 for survey response bias.

Table 8.3. Individual Management Deficiency Frequency Distribution

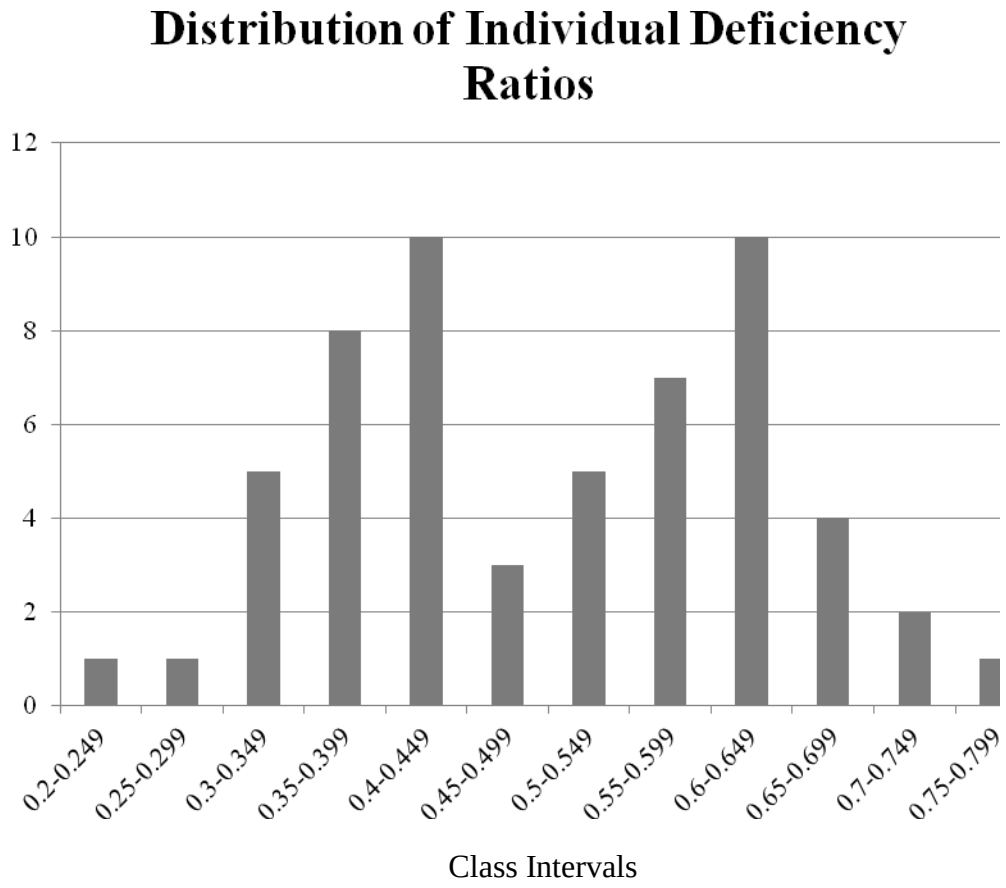
Ratio	Frequency
0.2 – 0.249	1
0.25 – 0.299	1
0.3 – 0.349	5
0.35 – 0.399	8
0.4 – 0.449	10
0.45 – 0.499	3
0.5 – 0.549	5
0.55 – 0.599	7
0.6 – 0.649	10
0.65 – 0.699	4
0.7 – 0.749	2
0.75 – 0.799	1

From the data in the table it was found that 30% of NPA committee members had a level of management deficiency of 60% or more which is a high level of deficiency and would bring into question their ability to carry out the responsibilities of a committee member in a competent manner. It was also found

that 26% of committee members were competent managers with a deficiency level of 40% or less.

The data in the frequency distribution table is displayed in Figure 8.1. The class intervals are shown on the horizontal axis and the frequencies are shown on the vertical axis.

Figure 8.1. The Distribution of Individual Management Deficiency Ratios



Individual management deficiency ratios were found to have a bi-modal distribution. There are two possible explanations for a distribution of this kind:

1. The associations in the sample form two distinct groups, one in which all committee members have a low level of management deficiency and one in which all committee members have a high level of management deficiency.
2. A “strong carry the weak” situation exists. That is, the management competencies and personal attributes needed to manage the affairs the association are concentrated in one or two committee members.

To investigate the first explanation the distribution of overall committee management deficiency was examined by association. Committee management deficiency was previously defined as the average of the individual management

deficiencies of the committee members. The data used in this analysis is displayed in Table 8.4 below.

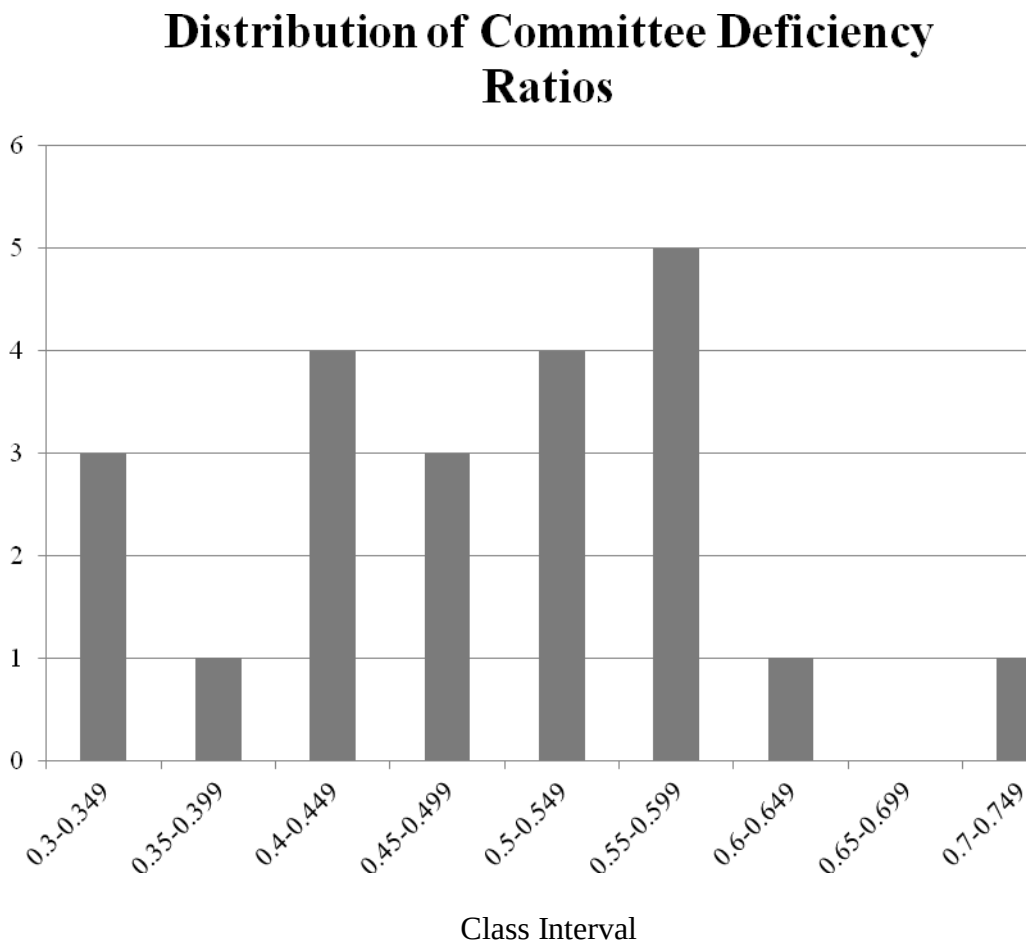
Table 8.4. Individual Management Deficiency Ratios by Association

NPA Code	Respondents							Average + Bias*
	1	2	3	4	5	6	Average	
ch	**0.145**						**0.145**	**0.310**
ak	**0.164**						**0.164**	**0.329**
ac	**0.209**	**0.127**					**0.168**	**0.333**
cg	**0.044**	**0.220**	**0.238**	**0.388**			**0.223**	**0.388**
cn	0.209	0.270					**0.240**	**0.405**
cd	0.197	0.312					**0.255**	**0.420**
be	**0.258**						**0.258**	**0.423**
az	**0.453**	**0.161**	**0.210**				**0.275**	**0.440**
bo	0.183	0.223	0.357	0.488			**0.313**	**0.478**
ay	**0.320**						**0.320**	**0.485**
ab	**0.186**	**0.255**	**0.384**	**0.483**			**0.327**	**0.492**
aj	**0.255**	**0.448**	**0.333**				**0.345**	**0.510**
aa	**0.182**	**0.418**	**0.473**	**0.244**	**0.383**	**0.503**	**0.367**	**0.532**
bz	0.398	0.345					**0.372**	**0.537**
bi	**0.190**	**0.402**	**0.561**				**0.384**	**0.549**
ba	**0.339**	**0.478**	**0.259**	**0.462**			**0.385**	**0.550**
bn	0.246	0.444	0.491				**0.394**	**0.559**
bd	**0.412**						**0.412**	**0.577**
ae	**0.260**	**0.526**	**0.428**	**0.459**			**0.418**	**0.583**
bg	**0.426**	**0.451**	**0.593**	**0.236**			**0.427**	**0.592**
bh	**0.457**						**0.457**	**0.622**
au	**0.570**						**0.570**	**0.735**

* Survey response bias of 0.165 has been added to the association averages.

The distribution of committee management deficiency presented in Table 8.4 is illustrated in Figure 8.2 below. The class intervals have been placed on the horizontal axis and frequencies are shown on the vertical axis.

Figure 8.2. The Distribution of Committee Management Deficiency Ratios



If associations fall into two distinct groups, one with a low average management deficiency and one with high average management deficiency, the distribution of committee management deficiency would be approximately bi-modal. The distribution illustrated in Figure 8.2 does not support that view. Therefore the first explanation was rejected in favour of the second explanation which led to the conclusion that, for smaller NPAs, the management competencies and personal attributes needed to manage the affairs of the association are concentrated in one or two individuals with the remaining committee members having a high level of management deficiency. This is the first time that evidence has led to this finding which has important implications for smaller NPAs.

It was reported in the literature review that NPA management performance is better if the management skills, management experience and relevant knowledge are balanced across the committee members (Schjoedt & Kraus 2009). The direct association between management performance and association performance was also identified in the literature (Alexander, Hearld & Mittler 2011, Brown 2005,

McDonagh 2006, Nicholson, Newton & McGregor-Lowndes 2012), These finding lead to the conclusion that if the management competencies needed to manage the affairs the association are not balanced across committee members but are concentrated in one or two individuals, both the committee and the association will be operating at a lower level of performance than they would be if the competencies of committee members were more balanced. In addition, the viability of the association could be at risk if the more competent individual or individuals suddenly left the association.

8.5 The Age Factor

In Chapter 3 it was recorded that a thorough search of the literature failed to find any evidence of past studies that investigated the relationship between age and non-profit management performance. It was medical evidence on the effect of aging on the brain and the possibility that NPA management teams have an older age profile than workers in the for-profit sector that led to age being included as a factor in this study. The information provided by the heuristic model enabled the age distribution of NPA committee members and the relationship between age and management deficiency to be investigated for the first time.

8.5.1 The Distribution of Age in NPA Committee Members

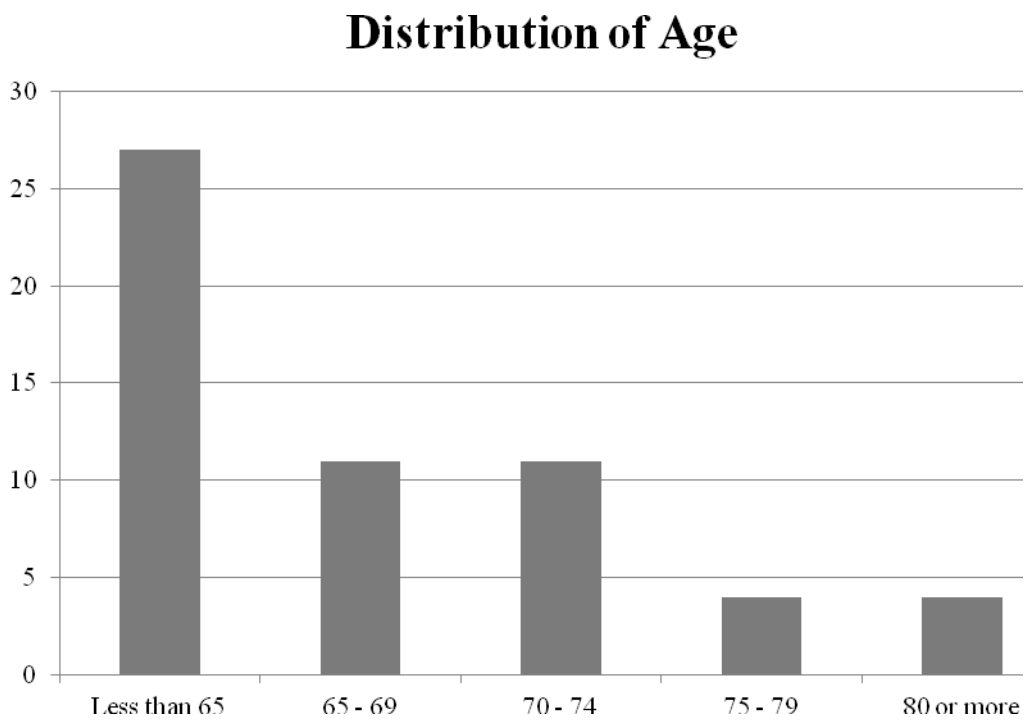
The frequency distribution of age for the sample of 57 committee members is presented in Table 8.5 below.

Table 8.5. Frequency Distribution of Age, Smaller NPAs

Age	Frequency
Less than 65	27
65 to 69	11
70 to 74	11
75 to 79	4
80 or more	4

The information in the frequency distribution table is illustrated in Figure 8.3 below. The horizontal axis shows the age groups used in this study and frequencies are shown on the vertical axis.

Figure 8.3. Age Distribution, All Respondents



The data shows that 53% of respondents were aged 65 years or more. At the time this data was collected the official retirement age was 65 years. Therefore, the evidence suggests that more than half the committee members of smaller NPAs are older than the official retirement age. The data was subjected to a more detailed examination to determine whether the age distribution is balanced across the participating NPAs. Table 8.6 below shows the age distribution for those associations that returned two or more surveys and the average deficiency ratio which is the committee age deficiency.

Table 8.6. Distribution of Deficiency in Age by Association

Code	< 65	65-69	70-74	75-79	> 80	Av. Def
aa	1	3	1	1		0.333
ab	1		3			0.375
ac	2					0
ae	2	1	1			0.188
aj		1			2	0.750
az	1		2			0.333
ba	1		1	1	1	0.563
bg	3	1				0.063
bi	1		1		1	0.500
bn		1		2		0.583
bo	3		1			0.125
bz	1	1				0.125
cd	2					0
cg	3	1				0.063
cn	1	1				0.125

The committee age deficiency ratios presented in Table 8.6 are illustrated in Figure 8.4 below. Associations are shown on the horizontal axis and committee deficiency in age is shown on the vertical axis.

Figure 8.4. Average Deficiency in Age by Association

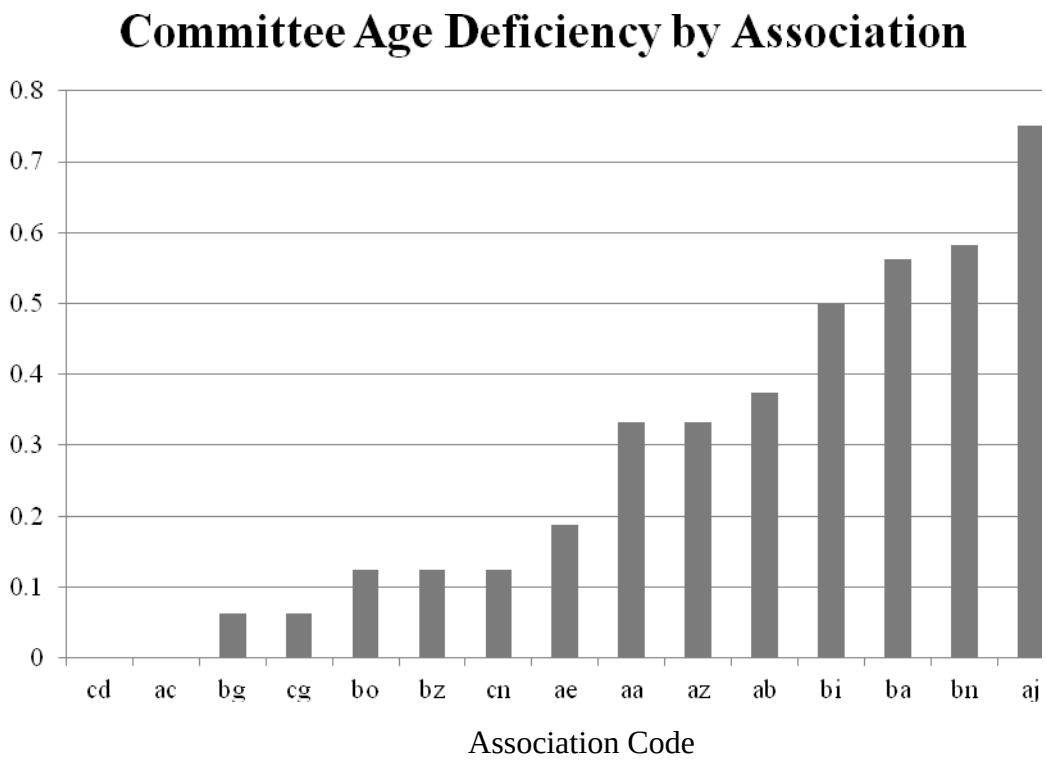


Figure 8.4 clearly illustrates that the distribution of the age factor is not balanced across the associations in the sample with 27% of associations recording a high level of deficiency in the age factor. The implication of this finding is presented in the next section.

8.5.2 The Relationship between Age and Management Deficiency

The evidence from the medical literature suggests that the management performance of those committees that have an old age profile would not be as good as that of associations that have a younger age profile. This theory was tested using the results produced by the heuristic model which enable the relationship between committee deficiency in age and committee management deficiency to be investigated for the first time. For the 15 associations in the sample the committee age deficiency ratios and overall committee management deficiency ratios were given a ranking from lowest to highest. The results are presented in Table 8.7 below.

Table 8.7. Committee Deficiency in Age and Committee Management Deficiency Rankings

NPA Code	Age Deficiency	Rank	Management Deficiency	Rank
aa	0.333	9.5	0.529	9
ab	0.375	11	0.489	7
ac	0	1.5	0.330	1
ae	0.188	8	0.580	14
aj	0.750	15	0.507	8
az	0.333	9.5	0.437	5
ba	0.563	13	0.547	12
bg	0.063	3.5	0.589	15
bi	0.500	12	0.546	11
bn	0.583	14	0.556	13
bo	0.125	6	0.475	6
bz	0.125	6	0.534	10
cd	0	1.5	0.417	4
cg	0.063	3.5	0.385	2
cn	0.125	6	0.402	3

The non-parametric version of the Spearman rank correlation coefficient was used for this analysis as the sample size is small (n=15) and the data is subjective in nature. The preliminary computations required are displayed in Table 8.8 below.

Table 8.8. Preliminary Computations for the Spearman Rank Correlation Coefficient

NPA Code	Rankings			
	Age Deficiency	**Management Deficiency**	d_i	d_i^2
aa	9.5	9	0.5	0.25
ab	11	7	4	16
ac	1.5	1	0.5	0.25
ae	8	14	- 6	36
aj	15	8	7	49
az	9.5	5	4.5	20.25
ba	13	12	1	1
bg	3.5	15	- 11.5	132.25
bi	12	11	1	1
bn	14	13	1	1
bo	6	6	0	0
bz	6	10	- 4	16
cd	1.5	4	- 2.5	6.25
cg	3.5	2	1.5	2.25
cn	6	3	3	9
			Sum	290.5

The Spearman rank correlation coefficient is given by the formula:

$r_s = 1 - (6 \sum d_i^2) / (n (n^2 - 1))$

where d_i are the differences between the rankings and n is the number of ordered pairs.

$r_s = 1 - (6 (290.5)) / (15 (225-1))$

$= 1 - 1743 / 3360$

$\approx 1 - 0.519$

≈ 0.5

For overall committee results produced by the model, the Spearman rank correlation coefficient indicates a moderate, positive relationship exists between the measurements of deficiency in the age factor and management deficiency. This result was derived from a sample of 15 NPAs which is considered to be an adequate sample size for the non-parametric analysis carried out. Therefore it can be considered to be a significant finding as it justifies the inclusion of age as a factor in the model and, for the first time, it provides evidence that there is a direct, positive relationship between age and management performance. The evidence from this study suggests that, for smaller NPAs committees, a high proportion have an old age profile which would be having an effect on their management performance.

8.6 Management Skills

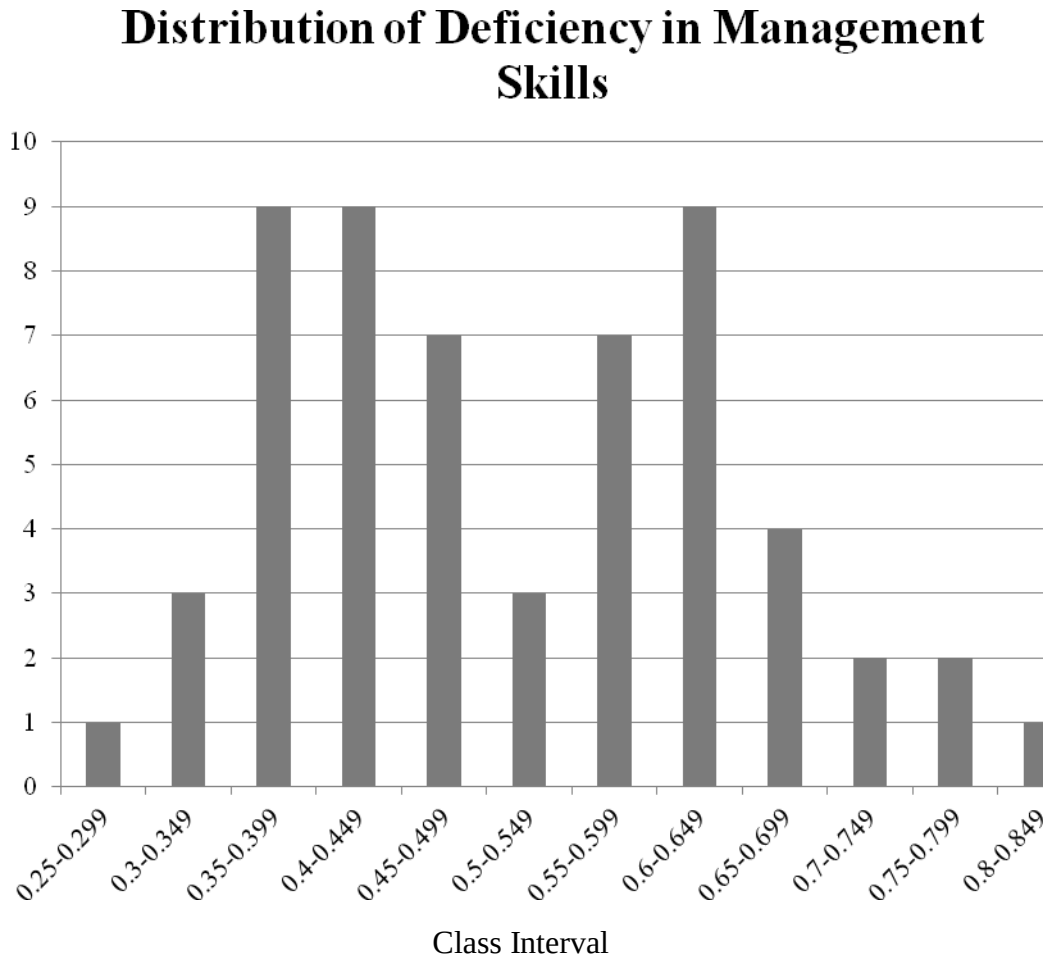
Based on the number of references found, management skills were identified in the literature as being the most important competency for an NPA committee member to possess. For all respondents, the average level of deficiency in management skills was assessed to be 52% which is relatively high compared to deficiency in the other factors. To investigate the distribution of deficiency in management skills a frequency distribution table using a class interval of 0.05 was constructed and the data illustrated using a frequency histogram. The frequency distribution table is presented below.

Table 8.9. Deficiency in Management Skills Frequency Distribution

Class Interval	Frequency
0.25 – 0.299	1
0.3 – 0.349	3
0.35 – 0.399	9
0.4 – 0.449	9
0.45 – 0.499	7
0.5 – 0.549	3
0.55 – 0.599	7
0.6 – 0.649	9
0.65 – 0.699	4
0.7 – 0.749	2
0.75 – 0.799	2
0.8 – 0.849	1

The data in the frequency distribution table is displayed in Figure 8.5 below. Class intervals are shown on the horizontal axis and frequencies are shown on the vertical axis.

Figure 8.5. The Distribution of Deficiency in Management Skills



Deficiency in management skills was found to have a bi-modal distribution. This situation mirrors that found for the distribution of individual management deficiency which again presents two possible explanations that could result in this type of distribution.

1. The associations in the sample form two distinct groups, one in which all committee members have a low level of deficiency in management skills and one in which all committee members have a high level of deficiency in management skills.
2. A "strong carry the weak" situation exists. That is, the management skills needed to manage the affairs the association are concentrated in one or two individuals.

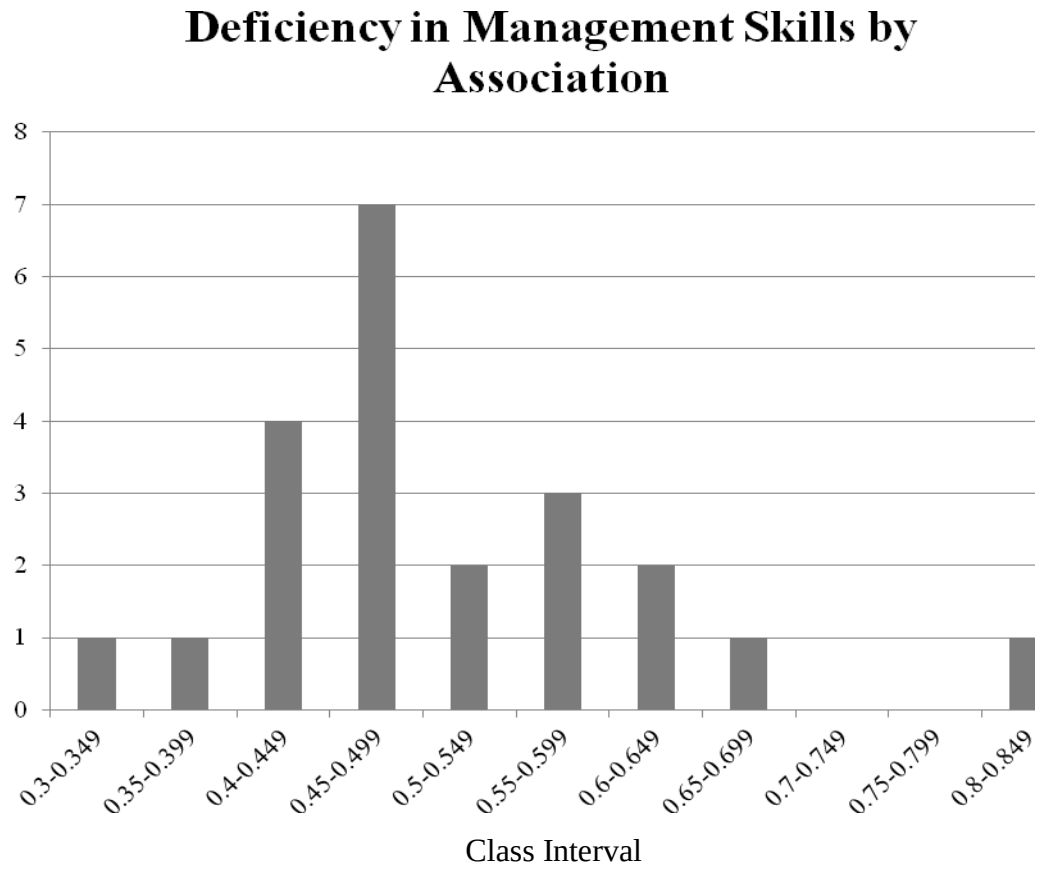
Following the approach adopted for individual management deficiency, the distribution of overall committee deficiency in management skills was examined by association. Table 8.10 below shows the frequency distribution table for association results using a class interval of 0.05.

Table 8.10. Deficiency in Management Skills by Association

Code	Management Skills Deficiency
ac	0.341
ba	0.448
cg	0.498
ae	0.617
ab	0.476
bg	0.658
az	0.476
bi	0.597
aj	0.472
ba	0.591
bn	0.484
bo	0.534
bz	0.580
cd	0.441
ay	0.449
ak	0.425
au	0.824
be	0.478
cn	0.391
aa	0.505
bh	0.610
ch	0.416

The distribution of deficiency in management skills by association presented in Table 8.10 is illustrated in Figure 8.6 below. Class intervals have been placed on the horizontal axis and frequencies are shown on the vertical axis.

Figure 8.6. The Distribution of Deficiency in Management Skills by Association



There is no evidence in the chart to support the view that associations fall into two distinct groups, one with a low average level of management skills deficiency and one with a high average level of management skills deficiency. This finding led to rejection of the first explanation and the acceptance of the second explanation. Therefore, the evidence suggests that management skills are concentrated in one or two individuals and are not distributed evenly throughout the committee. This finding has important implications for smaller NPAs. It was reported earlier in this study that most NPA failures are the result of weak, inexperienced management (Productivity Commission 2010). In this instance, weak management refers to deficiency in management skills. It would, therefore, be reasonable to assume that having management skills concentrated in one or two committee members could place the long term viability of an association at risk if the management skills of the competent committee members are not passed on to and developed within those committee members who are less competent. The detailed results produced by the heuristic model enabled management development, and other factors associated with the development of management skills, to be investigated.

Specific mention is made in the literature to the importance of having three particular management practices in place (Brown 2007, Cornforth 2001, Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Willems et al 2012):

1. Having the association's operational policies and procedures documented and distributed to committee members.
2. Putting new committee members through a comprehensive induction or orientation programme.
3. Having some form of management development programme in place

These management practices provide the means by which relevant knowledge and management skills are developed within a committee. Using the data collected from the sample, the heuristic model was able to measure deficiency in these management practices. The average level of deficiency in each management practice was calculated for all respondents in the sample and the results are displayed in Table 8.11 below.

Table 8.11. Deficiency in Management Practices

Management Practices	Deficiency
Operational policies and procedures documented and distributed to committee members.	52%
A comprehensive induction programme in place for new recruits to the committee	72%
Committee members participate in a management development programme	79%

The results reported above provide clear evidence that management practices that are considered to be important to overall management performance are being largely neglected by smaller NPAs. The implication of this finding is that, for smaller NPAs, very little is being done to develop the management skills of committee members. This situation suggests there is a lack of succession planning which could place the long term viability of the association at risk.

The results produced by the heuristic model enabled the relationship between deficiency in management skills and individual management deficiency to be investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 20.119$ $\sum_{i=1}^{n} x_i^2 = 8.123$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 10.855$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 1.0214$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i) (\sum_{i=1}^{n} y_i)) /n$ $Sxy = 0.7738$

$r = 0.7738 / \sqrt{(1.0214 * 0.9674)}$

$r \approx 0.8$

A correlation coefficient of 0.8 indicates that, for smaller NPAs, a strong, positive relationship exists between deficiency in management skills and individual management deficiency. This finding is consistent with the view expressed in the literature and provides firm evidence that deficiency in management skills will have a direct affect on individual management deficiency.

8.7 Management Experience

Management experience is also considered to be an important competency for a committee member to possess (Brown 2007, Nafukho 2007, Schjoedt and Kraus 2009, Thach & Thompson 2007). A lack of management experience has been identified as a major cause of NPA failures (Productivity Commission 2010). In a study that investigated both for-profit and non-profit management, Thach and Thompson (2007) found that there is substantial overlap in the key competencies required for good leadership in both sectors. It follows that an NPA committee member will benefit from both for-profit management experience and non-profit management experience. The management experience data collected from all respondents in the sample is provided in Table 8.12 below.

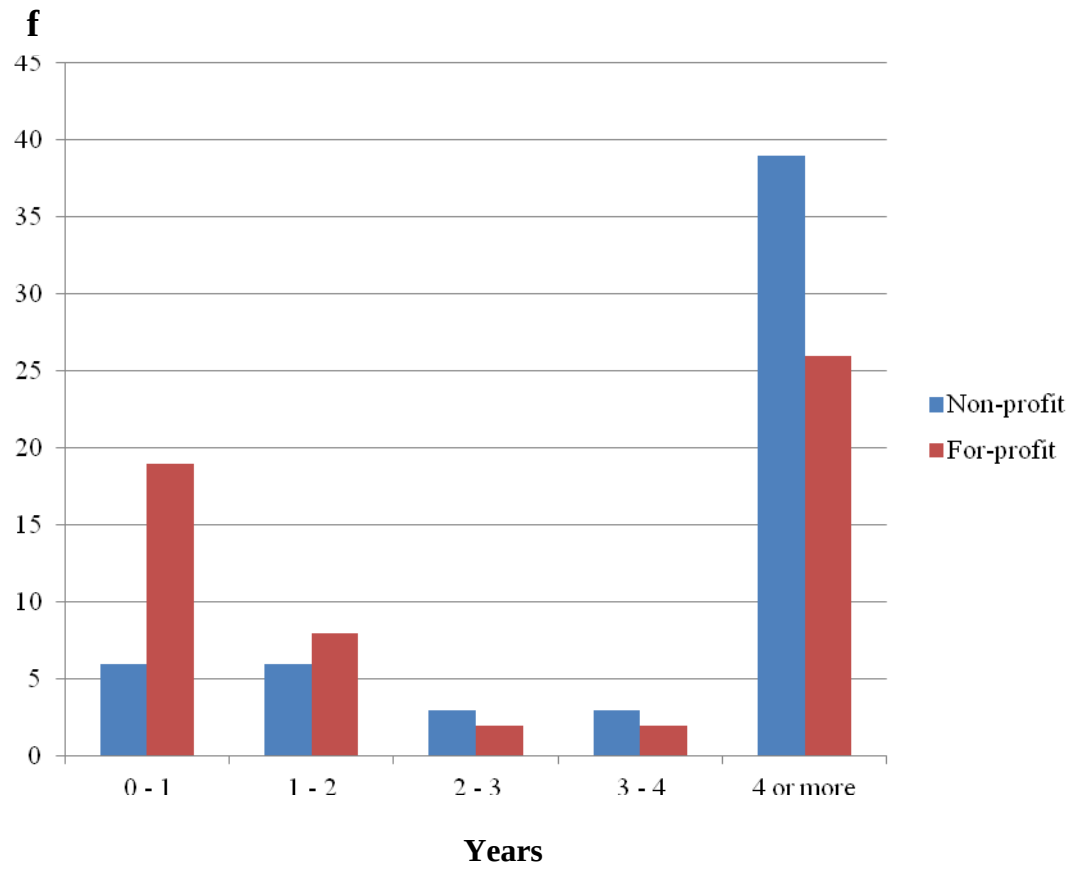
Table 8.12. Frequency Distribution for Management Experience

	Frequencies	
Years	**Non-profit Experience**	**For-profit Experience**
0 to 1	6	19
1 to 2	6	8
2 to 3	3	2
3 to 4	3	2
More than 4	39	26
Total	57	57

.

The information in the frequency distribution table is illustrated in Figure 8.7 below.

Figure 8.7. Years of Management Experience



The level of deficiency in non-profit management experience was assessed to be only 22% with 68% of respondents reporting they had four or more years experience in a non-profit management role. The level of deficiency in for-profit management experience was assessed to be higher at 47% but 46% of respondents reporting having four years or more of for-profit management experience. The results indicate that, on average, a low level of deficiency in management experience exists in smaller NPAs which suggests that management experience is a strength of smaller NPA committee members.

The results produced by the heuristic model enabled the relationship between deficiency in management experience and individual management deficiency to be investigated by calculating the regression coefficient for the two variables for the sample of 57 committee members. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 20.995$ $\sum_{i=1}^{n} x_i^2 = 11.920$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 12.156$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 4.1866$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i) (\sum_{i=1}^{n} y_i)) /n$ $Sxy = 1.6362$

$r = 1.6362 / \sqrt{(4.1866 * 0.9674)}$

$r \approx 0.8$

A correlation coefficient of 0.8 indicates that, for smaller NPAs, a strong positive relationship exists between deficiency in management experience and individual management deficiency. This finding is consistent with the view expressed in the literature and confirms the importance of experience to management performance.

8.8 Relevant Knowledge

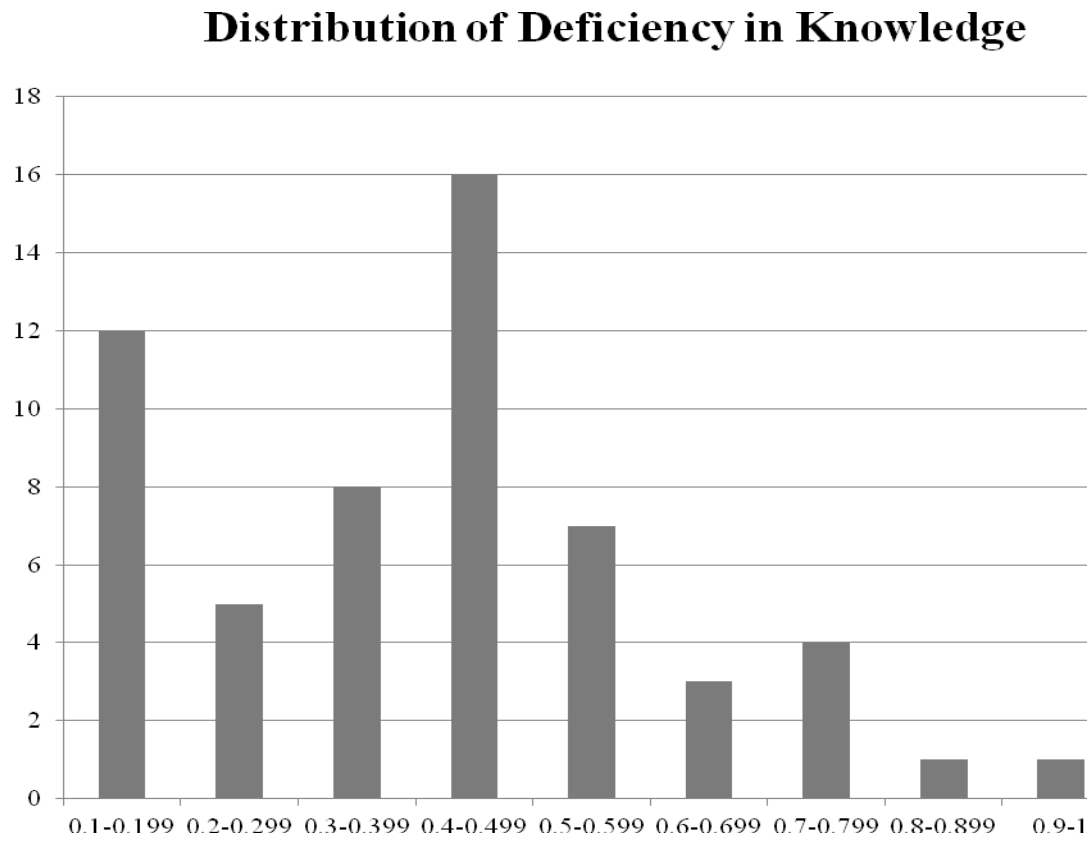
Relevant knowledge was identified in the literature as being an important competency for an NPA committee member to possess (Brown 2007, Nafukho 2009, Schjoedt & Kraus 2009, Thach & Thompson 2007). In this context the knowledge referred to is knowledge of the association's culture, norms and values as well as the processes, policies and procedures that provide management control of, and guidance for the organisation. For all respondents in the sample the average level of deficiency in relevant knowledge was assessed to be 42% which is relatively low and makes knowledge a strength of smaller NPA committees. To investigate the distribution of deficiency in knowledge a frequency distribution table using a class interval of 0.1 was constructed and the information displayed in a frequency histogram.

Table 8.13. Deficiency in Knowledge Frequency Distribution

Ratio	Frequency
0.1 – 0.199	12
0.2 – 0.299	5
0.3 – 0.399	8
0.4 – 0.499	16
0.5 – 0.599	7
0.6 – 0.699	3
0.7 – 0.799	4
0.8 – 0.899	1
0.9 – 1	1

The data in the frequency distribution table is displayed in Figure 8.8 below. The class intervals have been placed on the horizontal axis and frequencies are shown on the vertical axis.

Figure 8.8. The Distribution of Deficiency in Knowledge



Deficiency in knowledge was found to have a distribution which is skewed to the right with 72% of respondents having less than 50% deficiency in this factor.

The relationship between deficiency in knowledge and management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 14.614$ $\sum_{i=1}^{n} x_i^2 = 5.885$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 8.285$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 2.1380$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i)(\sum_{i=1}^{n} y_i))/n$ $Sxy = 0.9628$

$r = 0.9628 / \sqrt{(2.1380 * 0.9674)}$

$r \approx 0.7$

A regression coefficient of 0.7 indicates that, for smaller NPAs, quite a strong positive relationship exists between deficiency in relevant knowledge and individual management deficiency which confirms the importance of relevant knowledge to management performance. The model has again produced a finding that is consistent with the view expressed in the literature.

8.9 Commitment

There is considerable support in the literature for commitment being a factor associated with management performance. Past studies claim there is a strong relationship between commitment and individual management performance with committed committee members reported to be more involved and more valuable to the association (Allen & Meyer 1996, Cornforth 2001, Doherty & Hoye 2011, Preston & Brown 2004). In this study, the average level of deficiency in commitment for all respondents in the sample was assessed to be 58% which is relatively high. In addition, it was found that 58% of respondents had a level of deficiency in commitment of 50% or more. These findings make commitment to the association a weakness of smaller NPA committees.

The relationship between deficiency in commitment and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 32.822$ $\sum_{i=1}^{n} x_i^2 = 20.773$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 17.193$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 1.8737$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i)(\sum_{i=1}^{n} y_i))/n$ $Sxy = 0.7471$

$r = 0.7471 / \sqrt{(1.8737 * 0.9674)}$

$r \approx 0.6$

A correlation coefficient of 0.6 indicates that, for smaller NPAs, a moderate, positive relationship exists between deficiency in commitment and individual management deficiency. This finding is consistent with the view expressed in the literature and provides further evidence that a committed committee member is more valuable to the association than one that lacks commitment.

The information provided by the heuristic model enabled the relationship between deficiency in commitment and management deficiency to be investigated at the committee level. As the sample size is small (n=15) and the data is subjective in nature, it would be appropriate to use the non-parametric Spearman rank correlation coefficient for this analysis as a sample of 15 NPAs is considered to be an adequate sample size for non-parametric statistical analysis. For the 15 associations in the sample, the ratios for committee deficiency in commitment and committee management deficiency were given a ranking from lowest to highest. The results are presented in Table 8.14 below.

Table 8.14. Committee: Commitment Deficiency and Management Deficiency Rankings

NPA Code	Deficiency in Commitment	Rank	Committee Management Deficiency	Rank
ac	0.540	6.5	0.333	1
cg	0.519	4	0.388	2
cn	0.540	6.5	0.405	3
cd	0.623	8.5	0.420	4
az	0.637	10.5	0.440	5
bo	0.526	5	0.478	6
ab	0.332	1	0.492	7
aj	0.471	3	0.510	8
aa	0.457	2	0.532	9
bz	0.623	8.5	0.537	10
bi	0.637	10.5	0.549	11
ba	0.707	12	0.550	12
bn	0.721	13	0.559	13
ae	0.769	15	0.583	14
bg	0.728	14	0.592	15

The preliminary computations needed to calculate the coefficient are displayed in Table 8.15 below.

Table 8.15. Preliminary Computations for the Spearman Rank Correlation Coefficient

NPA Code	Deficiency in Commitment	Committee Management Deficiency	d_i	d_i^2
ac	6.5	1	5.5	30.25
cg	4	2	2	4.00
cn	6.5	3	3.5	12.25
cd	8.5	4	4.5	20.25
az	10.5	5	5.5	30.25
bo	5	6	-1	1.00
ab	1	7	-6	36.00
aj	3	8	-5	25.00
aa	2	9	-7	49.00
bz	8.5	10	-1.5	2.25
bi	10.5	11	-0.5	0.25
ba	12	12	0	0.00
bn	13	13	0	0.00
ae	15	14	1	1.00
bg	14	15	-1	1.00
			Sum	212.50

Calculation of the Spearman rank correlation coefficient:

$r_s = 1 - (6 \sum d_i^2) / (n (n^2 - 1))$ where n is the number of paired observations and d_i are the differences between the rankings.

$r_s = 1 - (6 (212.50)) / (15 (225-1))$

$= 1 - 1275 / 3360$

$\approx 1 - 0.379$

≈ 0.6

A Spearman rank correlation coefficient of 0.6 indicates a moderate, positive relationship exists between committee average deficiency in commitment and committee management deficiency. The analysis conducted in this section has found that deficiency in commitment affects both individual and overall committee management performance.

8.10 Other Factors Having a Positive Relationship with Management Deficiency

8.10.1 Financial Analysis

There are a number of references in the literature to the critical importance of financial control and the related areas of sustainability and the financial viability of the association. (Bhardwaj & Vuyyuri 2005, Brown 2005, Brown & Iverson 2004, Forbes 1998, Green & Griesinger 1996, Jackson & Holland 1998, Langabeer & Galeener 2007). It follows that committee members need to possess financial analysis skills to be aware of and monitor key financial performance measures. Following the same approach as that adopted earlier, the relationship between deficiency in financial analysis skills and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculations for the regression coefficient are shown below.

$\sum_{i=1}^{n} x_i = 24.738$ $\sum_{i=1}^{n} x_i^2 = 13.820$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 13.023$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 3.0834$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i) (\sum_{i=1}^{n} y_i)) /n$ $Sxy = 0.6275$

$r = 0.6275 / \sqrt{(3.0834 * 0.9674)}$

$r \approx 0.4$

A regression coefficient of 0.4 indicates that, for smaller NPAs, a moderate positive relationship exists between deficiency in financial analysis skills and individual management deficiency. This finding is consistent with the view expressed in the literature but, for smaller NPAs, it does not support the claim that a strong relationship exist.

The information provided by the heuristic model enabled the relationship between deficiency in financial analysis skills and management deficiency to be investigated at the committee level. As the sample size is small (n=15) and the data is subjective in nature, it would again be appropriate to use the non-parametric Spearman rank correlation coefficient For the sample of 15 NPAs, committee deficiency in financial analysis skills and committee management deficiency were given a ranking from lowest to highest. The results are displayed in Table 8.16 below.

Table 8.16. Deficiency in Financial Analysis and Committee Management Deficiency Rankings

NPA Code	Deficiency in Financial Analysis Skills	Rank	Management Deficiency	Rank
ac	0.165	1	0.333	1
cg	0.373	7	0.388	2
cn	0.248	2.5	0.405	3
cd	0.582	13	0.420	4
az	0.304	4.5	0.440	5
bo	0.436	11	0.478	6
ab	0.394	8.5	0.492	7
aj	0.248	2.5	0.510	8
aa	0.498	12	0.532	9
bz	0.415	10	0.537	10
bi	0.304	4.5	0.549	11
ba	0.394	8.5	0.550	12
bn	0.359	6	0.559	13
ae	0.707	15	0.583	14
bg	0.603	14	0.592	15

The preliminary computations needed to calculate the coefficient are displayed in Table 8.17 below.

Table 8.17. Preliminary Computations for Spearman Rank Correlation Coefficient

NPA Code	Deficiency in Commitment Ranking	Management Deficiency Ranking	d_i	d_i^2
ac	1	1	0	0.00
cg	7	2	5	25.00
cn	2.5	3	-0.5	0.25
cd	13	4	9	81.00
az	4.5	5	-0.5	0.25
bo	11	6	5	25.00
ab	8.5	7	1.5	2.25
aj	2.5	8	-5.5	30.25
aa	12	9	3	9.00
bz	10	10	0	0.00
bi	4.5	11	-6.5	42.25
ba	8.5	12	-3.5	12.25
bn	6	13	-7	49.00
ae	15	14	1	1.00
bg	14	15	-1	1.00
			Sum	278.50

Calculation of the Spearman rank correlation coefficient:

$r_s = 1 - (6 \sum d_i^2) / (n (n^2 -1))$ where n is the number of paired observations and d_i are the differences between the rankings.

$r_s = 1 - (6 (278.50)) / (15 (225-1))$

$= 1 - 1671 / 3360$

$\approx 1 - 0.497$

≈ 0.5

A Spearman rank correlation coefficient of 0.5 indicates that a slightly stronger relationship exists between committee deficiency in financial analysis skills and committee management deficiency than that observed for individual deficiency. This finding was derived from a sample of 15 NPAs which is considered to be an adequate sample size for the non-parametric analysis carried out. The results obtained in this section confirm the view expressed in the literature that a positive relationship exist between deficiency in financial analysis skills and management deficiency. This study has provided evidence that both individual management performance and overall committee performance are affected by deficiency in financial analysis skills.

8.10.2 Social Skills

Recent research has identified social skills as an important factor contributing to committee performance (Alexander et al 2011, McDonagh 2006, Nicholson et al 2012, Thach & Thompson 2007). Good social skills are required to develop a sense of cohesion (Thach & Thompson 2007) and collaborative committee functioning (McDonagh 2006) which have been found to be positively associated with committee performance. Following the approach adopted in earlier sections, the relationship between deficiency in social skills and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 28.165$ $\sum_{i=1}^{n} x_i^2 = 16.214$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 14.647$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 2.2973$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i) (\sum_{i=1}^{n} y_i)) / n$ $Sxy = 0.5340$

$r = 0.5340 / \sqrt{(2.2973 * 0.9674)}$

$r \approx 0.4$

This result indicates that, for smaller NPAs, a moderate, positive relationship exists between deficiency in social skills and individual management deficiency. This finding is consistent with the view expressed in the literature but, for smaller NPAs, this study suggests the relationship is not strong.

8.11 Factors with No Relationship with Management Deficiency

8.11.1 Strategic Planning

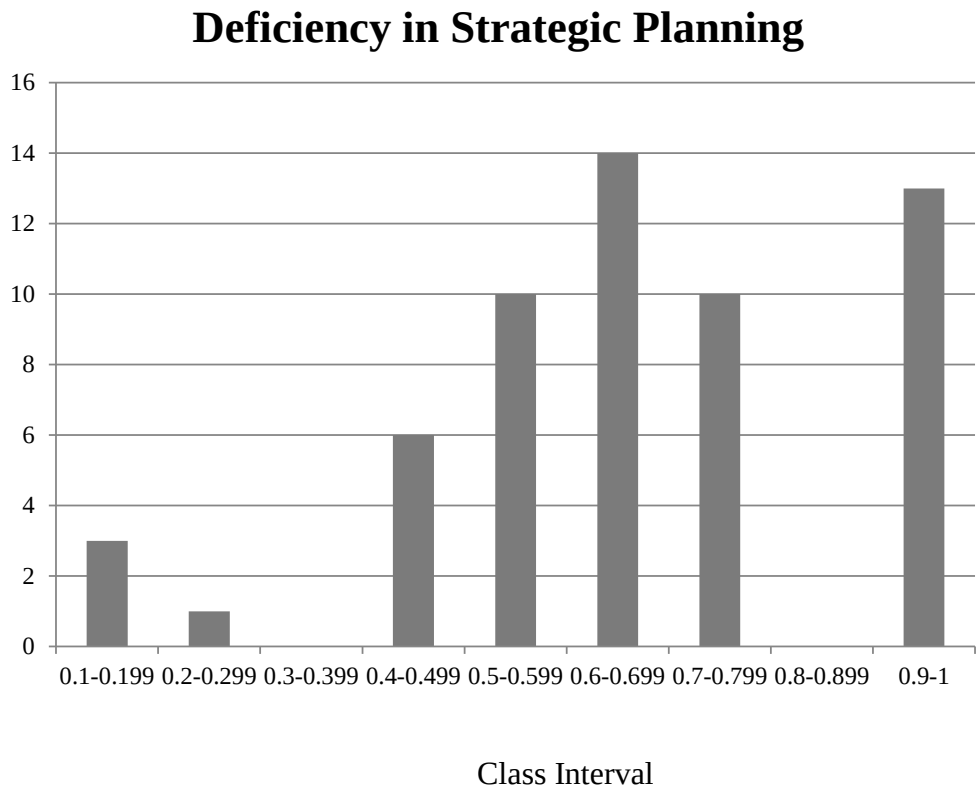
Many researchers have identified strategic planning and the committee's involvement in the planning process to be a critical success factor for an NPA. (Forbes 1998, Green & Griesinger 1996, Harrison & Sexton 2004, Langabeer & Galeener 2007, Taysir & Taysir 2012, Tucker 2010, Tucker & Parker 2013, Willems et al 2012). An analysis of the strategic planning results produced by the model began by examining the frequency distribution of deficiency in strategic planning for the sample of 57 respondents. A class interval of 0.1 was used to produce the frequency distribution table displayed below.

Table 8.18. Deficiency in Strategic Planning Frequency Distribution

Class Interval	Frequency
0.1 – 0.199	3
0.2 – 0.299	1
0.3 – 0.399	0
0.4 – 0.499	6
0.5 – 0.599	10
0.6 – 0.699	14
0.7 – 0.799	10
0.8 – 0.899	0
0.9 – 1	13

The data in the frequency distribution table is displayed in Figure 8.9 below. The class intervals have been placed on the horizontal axis and frequencies are shown on the vertical axis.

Figure 8.9. The Distribution of Deficiency in Strategic Planning



The distribution of deficiency in strategic planning is clearly skewed to the left with 82% of respondents assessed as having more than 50% deficiency. The average committee level of deficiency in this factor was found to be 68%. This result indicates that, for the smaller NPAs, long term planning is receiving little attention.

The relationship between deficiency in strategic planning and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 38.205$ $\sum_{i=1}^{n} x_i^2 = 28.245$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 19.194$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where

$Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $\quad Sxx = 2.6377$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $\quad Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i) (\sum_{i=1}^{n} y_i)) /n$ $\quad Sxy = 0.0506$

$r = 0.0506 / \sqrt{(2.6377 * 0.9674)}$

$r \approx 0$

A correlation coefficient of 0 indicates that, for smaller NPAs, there is no relationship between deficiency in strategic planning and individual management deficiency. This finding is in conflict with the view expressed in the literature that suggests a strong relationship exists between the two variables. The Spearman rank correlation coefficient calculated for overall committee deficiency in strategic planning and committee management deficiency was also found to be zero. Therefore, this study does not support the strategic planning findings reported in the literature. However, most of the past studies that investigated the relationship between strategic planning and management performance used data collected from the chief executive officers of large NPAs in the United States. It is possible that strategic planning is more important for larger NPA but that view cannot be confirmed from the evidence from this study so this is an area that needs further investigation.

8.11.2 Administrative Skills

There is a considerable amount of reference in the literature to the importance of sound management practices to overall management and association performance (Brown 2007, Cornforth 2001, Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Willems et al 2012). In this section, the specific management practices of interest are having the association's operational policies and procedures documented and distributed, putting new committee members through a comprehensive induction or orientation programme and having some form of management development programme in place. For this project, these management practices were placed under the heading administrative skills. They are also a collective responsibility of the committee so they were analysed at the overall committee level only and not at the individual committee member level. The data collected from the sample of 15 NPAs was used in the analysis. The deficiency ratios produced by the model for the three management practices, with adjustment for response bias, are presented in Table 8.19 below.

Table 8.19. Deficiency Ratios: Induction Programme, Policies & Procedures, Management Development Programme

NPA Code	Induction Programme	Policies and Procedures	Management Development	Average
ac	0.915	0.540	1.000	0.818
cg	0.603	0.353	0.603	0.520
cn	0.665	0.665	0.665	0.665
cd	0.540	0.415	0.665	0.540
az	0.915	0.748	0.832	0.832
bo	0.978	0.603	0.728	0.770
ab	0.478	0.290	0.728	0.499
aj	0.498	0.415	0.665	0.526
aa	0.623	0.540	0.957	0.707
bz	1.000	0.665	0.790	0.818
bi	0.998	0.498	0.998	0.831
ba	0.665	0.290	0.540	0.498
bn	0.582	0.582	0.832	0.665
ae	0.790	0.665	0.978	0.811
bg	0.415	0.728	0.915	0.686

There is a consistently high level of deficiency evident in the data displayed in this table. On average, NPAs were found to have a deficiency level of 68% across the three administrative practices.

The results produced by the heuristic model were used to investigate the relationship between committee deficiency in administrative skills and committee management deficiency. Table 8.20 below displays committee administrative skills deficiency ratios and committee management deficiency ratios for the 15

NPAs in this sample. Each set of data has been given a ranking from smallest to highest.

Table 8.20. Committee Deficiency in Administrative Skills and Committee Management Deficiency Rankings

NPA Code	Committee Deficiency in Administrative Skills	Rank	Committee Management Deficiency	Rank
ac	0.818	12.5	0.532	9
cg	0.520	3	0.492	7
cn	0.665	6.5	0.333	1
cd	0.540	5	0.583	14
az	0.832	15	0.510	8
bo	0.770	10	0.440	5
ab	0.499	2	0.550	12
aj	0.526	4	0.592	15
aa	0.707	9	0.549	11
bz	0.818	12.5	0.559	13
bi	0.831	14	0.478	6
ba	0.498	1	0.537	10
bn	0.665	6.5	0.420	4
ae	0.811	11	0.388	2
bg	0.686	8	0.405	3

As the sample size is small (n=15) and the data is subjective in nature, it would again be appropriate to analyse the data using the non-parametric Spearman rank correlation coefficient. The preliminary computations needed to calculate the coefficient are displayed in Table 8.21 below.

Table 8.21. Preliminary Computations for Spearman Rank Correlation Coefficient

NPA Code	Administrative Skills Ranking	Committee Deficiency Ranking	d_i	d_i^2
ac	12.5	1	11.5	132.25
cg	3	2	1	1.00
cn	6.5	3	3.5	12.25
cd	5	4	1	1.00
az	15	5	10	100.00
bo	10	6	4	16.00
ab	2	7	-5	25.00
aj	4	8	-4	16.00
aa	9	9	0	0.00
bz	12.5	10	2.5	6.25
bi	14	11	3	9.00
ba	1	12	-11	121.00
bn	6.5	13	-6.5	42.25
ae	11	14	-3	9.00
bg	8	15	-7	49.00
			Sum	540

Calculation of the Spearman rank correlation coefficient:

$r_s = 1 - (6 \sum d_i^2) / (n (n^2 - 1))$ where n is the number of paired observations and d_i are the differences between the rankings.

$r_s = 1 - (6 (540)) / (15 (225-1))$

$= 1 - 3240 / 3360$

$\approx 1 - 0.96$

≈ 0

The Spearman rank correlation coefficient indicates that no relationship exists between committee deficiency in administrative practices and overall committee management deficiency. This finding is in conflict with the view expressed in the literature that good management practices are directly associated with management performance (Brown 2007, Cornforth 2001, Forbes 1998, Green & Griesinger 1996, Herman & Renz 2002, Willems et al 2012). However, as was suggested for strategic planning in the previous section, it is possible that administrative skills are more important for the committee members of larger NPAs but the evidence from this study indicates that no relationship exists between administrative skills and management performance in smaller NPAs.

8.11.3 Resistance to Change

For all respondents, deficiency in the resistance to change factor was assessed to be 39% which is relatively low. This result indicates that, for smaller NPAs, management committees have a progressive outlook and are willing to accept change. The results produced by the model suggest that, in general, committee members do not prefer to appoint a friend when filling a vacancy on the committee which means they are using other criteria to select a new recruit. The relationship between resistance to change and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 respondents. The calculation of the regression coefficient is shown below.

$\sum_{i=1}^{n} x_i = 21.988$ $\sum_{i=1}^{n} x_i^2 = 9.502$ $\sum_{i=1}^{n} y_i = 28.561$

$\sum_{i=1}^{n} y_i^2 = 15.278$ $\sum_{i=1}^{n} x_i y_i = 11.239$

Correlation coefficient: $r = Sxy / \sqrt{(Sxx * Syy)}$

where $Sxx = \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2 / n$ $Sxx = 1.0198$

$Sxy = \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2 / n$ $Syy = 0.9674$

$Sxy = \sum_{i=1}^{n} x_i y_i - ((\sum_{i=1}^{n} x_i) (\sum_{i=1}^{n} y_i)) /n$ $Sxy = 0.2214$

$r = 0.2214 / \sqrt{(1.0198 * 0.9674)}$

$r \approx 0.2$

This result indicates that, for smaller NPAs, there is only a weak, positive relationship between resistance to change and individual management deficiency. Using overall committee results produced by the model for committee deficiency

in resistance to change and committee management deficiency, the Spearman rank correlation coefficient was also found to be 0.2. Therefore, the finding from this study is that only a weak relationship exists between resistance to change and management deficiency at both the individual and committee level.

8.12 Conclusion

The availability of data from a large sample of committee members enabled a more robust statistical analysis to be conducted to investigate the alignment of the results obtained from the heuristic model and the measurement of management deficiency obtained by an alternate method. This analysis validates the results produced by the heuristic model and indicates that a high level of confidence, in a statistical sense, can be placed on the ability of the model to produce an acceptable, approximate solution to the measurement of management deficiency in an NPA.

The estimate of survey response bias was subjected to further refinement using the data collected from the sample and the results produced by the heuristic model from the sample data enabled a general profile of an NPA committee to be developed. It was found that 30% of committee members had a high level of deficiency in the competencies and personal attributes needed to carry out their responsibilities while 26% had a low level of management deficiency which would suggest they are able to manage the affairs of the association in a competent manner.

A detailed analysis of the relationships between deficiency in the factors and management deficiency was carried out. A strong, positive relationship was found between individual management deficiency and deficiency in management skills, management experience and relevant knowledge. The implication of this finding is that deficiency in these areas of competency would have a significant impact on the management performance of the individual and the committee as a whole. The average level of deficiency in the three factors for the sample of 57 committee members is displayed in Table 8.22 below.

Table 8.22. Factor Average Deficiency Ratios

Average Factor Deficiency		
Skills f_1	**Experience** f_2	**Knowledge** f_3
0.518	0.368	0.421

Deficiency in management experience and relevant knowledge was relatively low and, on average, represents an area of strength for smaller NPA management

teams. Deficiency in management skills was relatively high but this result was heavily affected by a very high level of deficiency in strategic planning and administration skills. The evidence suggests that long term planning, management development and putting new recruits to the committee through a comprehensive induction programme are areas that receive little attention.

The analysis of the data presented in this chapter produced findings that are consistent with those made in past studies reported in the literature and provided firm evidence of the strength of the relationship between several performance factors and individual management performance. Of particular significance was the identification of a positive relationship between age and management deficiency.

The next chapter presents a summary of the research project and the main findings, identifies areas for possible further research and outlines the contribution that this study has made to new knowledge.

Chapter 9. Research Outcomes and Recommendations

9.1 Introduction

This research project addressed the long standing problem of finding a solution to the measurement of management performance in non-profit associations. Traditional, analytical approaches to solve this complex, multi-dimensional problem have failed to find a solution that has broad acceptance. Research has concentrated on an assessment of overall committee performance (Brown 2007) and has, in general, adopted a positivist approach, focussing on factors associated with good management performance (Cornforth 2012). For this project a completely different approach was adopted for both the dimension of management performance to be measured and the methodology employed to measure it.

This study can be described as comprehensive as it applied a thorough, disciplined approach, based on the accumulated knowledge documented in the relevant literature, to identify the factors associated with management performance and develop techniques to quantify the identified factors. For this field, the study then pioneered the application of a heuristic approach to define the relationships between the factors and build a model that does produce an acceptable, approximate solution to the measurement of management deficiency in individual NPA committee members.

This chapter presents a summary of the adopted approach, the research outcomes and the main findings from this project. Possible areas for further research are identified and the chapter concludes with an outline of the contribution this project has made to new knowledge.

9.2 Summary of Research Background Information

Cost considerations and a wish to avoid the possibility of introducing additional factors that could add to the complexity of the problem, created a need to narrow the scope of the project. The population of NPAs was limited to smaller associations that are run entirely by volunteers. A homogeneous population was created by restricting the population to associations that have an art related community purpose. This decision was made to avoid possible data access issues and facilitate the data collection process only and does not narrow the scope of the project by limiting the application of the model to smaller NPAs with a different field of interest.

In Chapter 1, non-profit associations were defined to be organisations that do not distribute profits to their members. They exist solely for the purpose of achieving the community purpose for which they were established. For an association to become incorporated, which allows it to access government funding and concessions, it must be a non-profit association. This scope of this study is limited to smaller, incorporated, non-profit associations run entirely by volunteers.

Management performance has a number of dimensions so it was necessary to decide which dimension would become the focus of this study. Chapter 1, Section 1.3.1 presented a detailed justification for adopting management deficiency as the focus. Evidence was found in the literature that identified management deficiencies as the single most critical explanatory factor associated with organisation failures (Nicholson, Newton & McGregor-Lowndes 2012, Productivity Commission 2010, Risk Alert 2013). Management deficiencies can prevent an organisation from effectively anticipating, responding and adapting to changing operating conditions and set the organisation up to make critical mistakes (Block 2004; Non-profit Finance Fund 2014; Jewell 2013; Risk Alert 2013). More specifically, weak, inexperienced management has been identified as the cause of most NPA failures (Productivity Commission 2010).

There is further support in the literature for adopting a research focus on management weaknesses or deficiencies. An investigation into poorly performing boards conducted by Salamon and Chinnock (2004) found that an important challenge facing boards is the appropriate diagnosis of their weaknesses and that little research has been carried out in this area. In another study, management committees that carry out some form of performance assessment, examining their practices and processes in a way that looks for areas where improvement is possible, were found to be in a better position to increase overall association performance (Overell 2011). Selecting management deficiency as the dimension of management performance to be measured delivers the actionable information that NPAs need to identify areas of weakness and, by working to overcome those weaknesses, improve their management performance.

The main problem facing NPAs that want to improve the performance of their management team is that no simple, widely accepted technique has been developed that can provide the reliable information they need in a timely manner. The aim of this research project was to address this problem and develop a model that provides an acceptable, approximate solution to the measurement of management deficiency across a wide range of factors, is easy to use and delivers results in a timely manner.

It has been established that measuring management deficiency is a complex, multi-dimensional problem. The review of the literature presented in Chapter 2 found clear evidence that in a situation where the solution of a problem involves many variables, is overly complex and no acceptable solution has been found by traditional methods, a heuristic approach may provide an acceptable, approximate solution (Chen & Li 2008, Dawande, Gavirneni & Tayur 2006, Yang, Karaesmen & Keskinocak 2008, Zeng, Costello & Hodgson 2010). This finding can be applied to the current state of research into measuring non-profit management performance. Therefore, it was logical to adopt a heuristic approach to build a model that provides a satisfactory solution to the problem. The methodology adopted for this task was the standard heuristic modelling technique known as simulated annealing. Simulated annealing is a mathematical technique that has been applied to find approximate solutions to complex problems across a wide range of applications (Kirkpatrick, Gelatt & Vecchi 1983). A description of this methodology was provided in Chapter 3. To demonstrate that the heuristic model produces an acceptable, approximate solution to the measurement of individual management deficiency, it was necessary to validate the findings from the model by establishing that there is alignment of the model results with an assessment of

individual management deficiency obtained by an alternate method. An individual performance ratings method was developed for this purpose.

9.3 The Main Research Findings

9.3.1 The Heuristic Model

This study has established that the following heuristic model does produce an acceptable, approximate measurement of individual management deficiency, d, for an NPA committee member:

$$d = 0.165 + 0.286\, f_1 + 0.238\, f_2 + 0.167\, f_3 + 0.167\, f_4 + 0.071\, f_5 + 0.071\, f_6$$

where

$$f_1 = 0.161\, e_1 + 0.036\, e_2 + 0.214\, e_3 + 0.250\, e_4 + 0.089\, e_5 + 0.161\, e_6 + 0.089\, e_7$$

$$f_2 = 0.667\, e_8 + 0.333\, e_9$$

$$f_3 = 0.4\, e_{10} + 0.3\, e_{11} + 0.2\, e_{12} + 0.1\, e_{13}$$

$$e_4 = 0.417\, s_1 + 0.167\, s_2 + 0.417\, s_3$$

$$e_8 = 0.5\, s_4 + 0.5\, s_5$$

An assessment of committee management deficiency is given by:

$$D = {}^{1}/_{n} \sum_{i=1}^{n} d_i$$

where

D = committee management deficiency n = number of committee members

d = individual management deficiency

f_1 = skills factor f_2 = experience factor f_3 = knowledge factor

f_4 = commitment factor f_5 = resistance to change factor f_6 = age factor

e_1 = organisational skills element e_2 = asset management skills element

e_3 = administration skills element e_4 = analytical skills element

e_5 = communication skills element e_6 = social skills element

e_7 = political skills element e_8 = management experience element

e_9 = involvement in activities element e_{10} = association objectives element

e_{11} = policies and procedures element e_{12} = individual responsibilities element

e_{13} = legal obligations element

s_1 = financial analysis skills s_2 = problem solving/decision making skills

s_3 = strategic planning skills s_4 = non-profit management experience

s_5 = for-profit management experience

The simulated annealing methodology employed in this study indicated that the refinements made to the initial form of the model followed a solution path which clearly illustrated that an optimal state had been reached. This heuristic model was rigorously tested and the results produced were validated by establishing that there is an alignment of the results produced by the model and those obtained by an alternate method. The analysis carried out in the validation process established that a high level of confidence, in a statistical sense, can be placed on the results produced by the model.

9.3.2 Individual Management Deficiency

A key finding of this study is that individual management deficiency measurements for smaller NPAs have a bi-modal distribution. A further investigation of this observation found that, for smaller NPAs, the management competencies needed to manage the affairs of the association are concentrated in one or two committee members. It was reported in the literature review that committee management performance is better if the competencies required to manage the affairs of the NPA are balanced across the committee members (Schjoedt & Kraus 2009). The finding that management competencies are concentrated in one or two committee members has two important implications for smaller NPAs. Firstly, the committee will be operating at a lower level of performance than it would be if the competencies of committee members were more balanced. Secondly, the viability of the association would be at risk if the more competent individual or individuals suddenly left the association.

The first point above leads to another implication of this finding. The direct association between management performance and association performance was identified in the review of the literature (Alexander, Hearld & Mittler 2011, Brown 2005, McDonagh 2006, Nicholson, Newton & McGregor-Lowndes 2012). Therefore, the finding that management competencies are not balanced across the committee members implies that the performance of the association will be adversely affected by this lack of balance.

The results produced by the heuristic model from the sample data enabled a general profile of an NPA committee to be developed. It was found that 30% of committee members have a high level of deficiency in the competencies and personal attributes needed to carry out their responsibilities while 26% have a low level of management deficiency which would suggest they are able to manage the affairs of the association in a competent manner. It was also found that a "strong carry the weak" situation exists with the competencies needed to manage the affairs of an association concentrated in one or two committee members.

A detailed analysis of the relationships between deficiency in the factors and management deficiency was carried out. The results of this analysis for individual factors are summarised in the following sections. It was found that a strong, positive relationship exists between individual management deficiency and deficiency in management skills, management experience and relevant knowledge. The implication of this finding is that deficiency in these areas of

competency could have a significant impact on the management performance of the individual and the committee as a whole. The average level of deficiency in the three factors for the sample of 57 committee members is displayed in Table 9.1 below.

Table 9.1. Factor Average Deficiency Ratios

Average Factor Deficiency		
Skills f_1	**Experience** f_2	**Knowledge** f_3
52%	37%	42%

Deficiency in management experience and relevant knowledge is relatively low and, on average, represents an area of strength for smaller NPA management teams. Deficiency in management skills is relatively high but this result is heavily affected by a very high level of deficiency in strategic planning and administration skills. The evidence suggests that long term planning, management development and putting new recruits to the committee through a comprehensive induction programme are areas that receive little attention.

9.3.3 The Relationship between Age and Management Deficiency

Another key finding of this study is that, for committee members of smaller NPAs, a positive relationship exists between age and management deficiency. A thorough search found no references in the non-profit literature to research that investigated the relationship between age and management performance in non-profit associations. Therefore it was not possible to compare the age related findings from this study with those obtained by other researchers. The data collected indicated that 53% of committee members are aged 65 years or more. At the time this data was collected the official retirement age was 65 years. Therefore, the evidence suggests that more than half the committee members of smaller NPAs are older than the official retirement age. Further investigation found that the distribution of the age factor is not balanced across the associations in the sample with 27% of associations recording a high level of deficiency in the age factor.

For overall committee results produced by the model, the Spearman rank correlation coefficient ($r_s = 0.5$) indicates a moderate, positive relationship exists between the measurements of deficiency in the age factor and management deficiency. This finding was derived from a sample of 15 NPAs which is considered to be an adequate sample size for the non-parametric analysis carried out. Therefore, it is a significant result in that it justifies the inclusion of age as a factor directly associated with non-profit management performance and, for the

first time, it provides evidence that there is a direct relationship between age and management performance.

9.3.4 Deficiency in Management Skills

Management skills were identified in the literature as being the most important competency for an NPA committee member to possess based on the number of references found that reported the importance of this factor to management performance. For all respondents in the sample the average level of deficiency in management skills was assessed to be 52% which is relatively high in comparison with deficiency in the other factors. Deficiency in management skills was found to have a bi-modal distribution which mirrored the distribution of individual management deficiency ratios. Further investigation of deficiency in management skills led to the conclusion that, in general, the management skills needed to manage the affairs of smaller NPAs are concentrated in one or two individuals. The implications of this finding are similar to those documented for individual management deficiency but, most importantly, the viability of the association could be at risk if the more competent committee members suddenly left the association. The detailed results produced by the heuristic model also provided clear evidence that, for the smaller NPAs, very little is being done to pass on management skills to, and develop the competencies of, both new recruits to the committee and the less competent committee members.

The relationship between deficiency in management skills and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 committee members. The regression coefficient was found to be 0.8 which indicates that, for smaller NPAs, a strong, positive relationship exists between deficiency in management skills and individual management deficiency. This finding is consistent with the view expressed in the literature and reinforces the importance of management skills to individual management performance. This consistency also provides further evidence that the model produces reliable results.

9.3.5 Deficiency in Management Experience

Second only to management skills, management experience is an important competency for a committee member to possess (Brown 2007, Nafukho 2007, Schjoedt and Kraus 2009, Thach & Thompson 2007). Not only is management experience believed to be positively associated with management performance but a lack of management experience has been identified as a major cause of NPA failures (Productivity Commission 2010). In this study the level of deficiency in non-profit management experience was assessed to be 22% with 68% of respondents reporting they had four or more years experience in a non-profit management role. This result indicates that, on average, a low level of deficiency in management experience exists which means that non-profit management experience is a strength of committee members of smaller NPAs.

The relationship between deficiency in management experience and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 committee members. The regression

coefficient was found to be 0.8 which indicates that, for smaller NPAs, a strong, positive relationship exists between deficiency in management experience and individual management deficiency. This finding provides evidence to support the view expressed in the literature and confirms the importance of management experience to individual management performance. It also provides further evidence of the reliability of the results produced by the heuristic model.

9.3.6 Deficiency in Relevant Knowledge

Relevant knowledge was identified in the literature as being an important competency for an NPA committee member to possess (Brown 2007, Nafukho 2009, Schjoedt & Kraus 2009, Thach & Thompson 2007). In this context the knowledge referred to is knowledge of the association's culture, norms and values as well as the processes, policies and procedures that provide management control of, and guidance for the organisation.

For all respondents in the sample, the average level of deficiency in knowledge was assessed to be 42% which is relatively low. In addition, deficiency in knowledge was found to have a distribution that is skewed to the right with 72% of respondents having below 50% deficiency in this factor. The results indicate that relevant knowledge is a strength of the committees of smaller NPAs.

Following the same approach adopted for other factors, the relationship between deficiency in knowledge and management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 committee members. The regression coefficient was found to be 0.7 which indicates that, for smaller NPAs, quite a strong, positive relationship exists between deficiency in knowledge and individual management deficiency. This finding is consistent with the view expressed in the literature. It also confirms the importance of relevant knowledge to individual management performance and provides further evidence of the reliability of the results produced by the heuristic model.

9.3.7 Deficiency in Commitment to the Association

Commitment is claimed to be an important factor associated with management performance with committed committee members reported to be more involved and more valuable to the association than those that lack commitment (Allen & Meyer 1996, Cornforth 2001, Doherty & Hoye 2011, Preston & Brown 2004). For the sample of 57 respondents, the average level of deficiency in commitment was found to be 58% which is relatively high and makes commitment to the association a weakness of the committees of smaller NPA.

For deficiency in commitment and individual management deficiency results, the regression coefficient was calculated and found to be 0.6 which indicates that, for smaller NPAs, a moderate, positive relationship exists between deficiency in commitment and individual management deficiency. Overall committee results produced by the model also produced a Spearman rank correlation coefficient of 0.6. The analysis of the commitment results provides further evidence that there is a direct, positive relationship between commitment and management performance

which confirms the view expressed in the literature that a committed committee member is more valuable to the association than one that lacks commitment.

9.3.8 Deficiency in the Resistance to Change Factor

For all respondents, deficiency in the resistance to change factor was assessed to be 39% which is quite low. This result indicates that, for smaller NPAs, management committees generally have a progressive outlook and are willing to accept change. The relationship between resistance to change and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 committee members. The regression coefficient was calculated to be 0.2 which indicates that, for smaller NPAs, there is a positive relationship between resistance to change and individual management deficiency but that relationship is weak in a statistical sense. The analysis of overall committee results produced a similar finding.

However, this study has produced important findings for the existence of resistance to change within the committees of smaller NPAs which provide justification for its inclusion as a factor associated with management performance. Firstly, there is a positive relationship between resistance to change and management deficiency but the relationship is weak. Secondly, the average level of resistance to change within NPA committees is low which indicates that, in general, committees have a progressive outlook and are willing to accept change which places them in a favourable position to adapt to changes in their operating environment.

9.3.9 Order of Importance of Management Deficiency Factors

An important part of the refinement of the heuristic model was the estimation of the coefficients of the independent variables. This process was documented in Chapter 5. The model comprises seven equations which define the relationships between the factors associated with management performance. The most important of these is the individual management deficiency equation:

$$d = 0.165 + 0.286\, f_1 + 0.238\, f_2 + 0.167\, f_3 + 0.167\, f_4 + 0.071\, f_5 + 0.071\, f_6$$

which defines the relationship between individual management deficiency, d, and the primary management performance factors, f_i , identified in this study. The coefficients of the independent variables in this equation were estimated using a process that was based on the number of studies in the literature that found an association between the factors and management performance. The accuracy of the approximate solution produced by the model is dependent upon how well this process was able to rank the independent variables in terms the importance of their contribution to determining the value of the dependent variable. Weights, which ultimately became their coefficients, were allocated to the variables according to the reverse order of the ranking. An evaluation of how well the variables were ranked can be made by comparing the rank order produced from the review of the literature with the correlation coefficients obtained when the

relationship between deficiency in each variable and individual management deficiency was assessed. Table 9.2 below shows the factors ranking and the correlation coefficients with their rank order.

Table 9.2. Factor and Correlation Coefficients Ranking

Factor	Rank	Correlation Coefficient	Rank
Management Skills	1	0.8	1.5
Management Experience	2	0.8	1.5
Relevant Knowledge	3.5	0.7	3
Commitment	3.5	0.6	4
Age	5.5	0.5	5
Resistance to Change	5.5	0.2	6

The information in Table 9.2 shows a very high level of consistency between the rank order of the factors and the corresponding correlation coefficients. The Spearman rank correlation coefficient for the data displayed in Table 9.1 was calculated to be 0.96. This finding is significant as it validates the technique used to estimate the coefficients of the independent variables in the model's set of equations and provides evidence that the heuristic approach adopted for this study does effectively produce an estimate for the coefficients that were previously unknown.

9.3.10 Deficiency in Financial Analysis Skills

There are a number of references in the literature to the critical importance of financial control and the related areas of sustainability and the financial viability of the association. (Bhardwaj & Vuyyuri 2005, Brown 2005, Brown & Iverson 2004, Forbes 1998, Green & Griesinger 1996, Jackson & Holland 1998, Langabeer & Galeener 2007). It follows that committee members need to have the competency to be aware of and monitor the key financial performance measures for their association. This competency is referred to as financial analysis skills in the heuristic model. Following the same approach adopted for the other factors, the relationship between financial analysis skills and individual management deficiency was investigated by calculating the regression coefficient for the two variables for the sample of 57 committee members. The regression coefficient was found to be 0.4. For overall committee results the Spearman rank correlation coefficient was 0.5. The statistical analysis indicates that, for smaller NPAs, a

moderate, positive relationship exists between financial analysis skills and individual management deficiency. Although this finding is consistent with the view expressed in the literature, for smaller NPAs, the evidence from this study indicates that the relationship is not as strong as the findings presented in the literature suggest.

9.3.11 Deficiency in Strategic Planning Skills

Many researchers have identified strategic planning and the committee's involvement in the planning process to be a critical success factor for an NPA. (Forbes 1998, Green & Griesinger 1996, Harrison & Sexton 2004, Langabeer & Galeener 2007, Taysir & Taysir 2012, Tucker 2010, Tucker & Parker 2013, Willems et al 2012). In this study, the distribution of deficiency in strategic planning was found to be skewed to the left with 82% of respondents assessed as having a level of deficiency greater than 50%. The average level of deficiency in this factor was found to be 68% which indicates that, for smaller NPAs, long term planning is receiving little attention. It was, therefore, important to investigate the relationship between deficiency in strategic planning skills and individual management deficiency to determine whether the finding reported in the literature is supported by the results produced by this study.

The relationship was assessed by calculating the regression coefficient for the two variables, deficiency in strategic planning skills and individual management deficiency, for the sample of 57 committee members. The regression coefficient was calculated to be approximately zero which indicates that, for smaller NPAs, there is no relationship between strategic planning skills and individual management deficiency. This is an important finding as it is in conflict with the view expressed in the literature. However, there are important methodological differences between this study and those reported in the literature. Past studies have focussed on larger NPAs and collected data from their CEOs. The sample for this study was drawn from volunteer-only NPAs which are smaller organisations and collected data from committee members. The evidence from this study suggests that long term planning receives little attention from smaller NPAs but that situation does not affect management performance.

9.3.12 Summary

Within the limited scope of this research project some important findings have been made. Thorough testing and validating of the results obtained have established that the heuristic model developed in this study does produce an acceptable, approximate solution to the measurement of management deficiency in smaller NPAs.

A general profile of the management committee of smaller NPAs has emerged from this study. The findings indicate that the competencies required to manage the affairs of the association are concentrated in one or two committee members. The evidence suggests that, within an NPA committee, some committee members have a high level of management deficiency but this weakness is compensated for by one or two competent individuals serving on that committee who have a low

level of management deficiency. A key finding of this study is that the experience gained from years of serving on the committee, combined with the accumulated knowledge of the association's norms and management processes, forms the means by which the association is managed.

The findings from this research project have provided evidence that the most important competencies for a committee member to possess are management skills, management experience and relevant knowledge. Each of these factors has a strong, positive relationship with management performance. The implication of this finding is that the level of deficiency in these areas of competency will directly affect the level of individual and committee management deficiency.

Commitment to the association and age were found to be important personal attributes for an NPA committee member. The results obtained support the view that a committed committee member is more valuable to the association than one that is not committed and there is evidence to suggest that as age increases the level of individual management deficiency increases.

9.4 Contribution to Research

This study represents a new field for the application of heuristics. A thorough search of the literature found no references to studies that used simulated annealing to find an approximate solution to the measurement of management performance. No established techniques were available to identify and quantify the variables, no formulae or traditional analytical methodology was available to specify the relationships between the variables and no established procedure was available to validate the results produced by the model. Each of the above aspects of the study required new methods to be developed to keep the project moving toward the achievement of its objective. These methods provide a foundation for the application of heuristic methodology to further research in the non-profit field and areas of management performance assessment in the for-profit sector.

The strength of this study is its focus on management deficiency and individual competencies and personal attributes. Past approaches have focussed on group indicators of performance (Brown 2007) and largely ignored the individual contributions of committee members to overall committee performance (Doherty & Hoye 2011).

The contributions this research has made to new knowledge are presented below:

1. A rigorous, disciplined approach has been established to build a model framework that can assist in identifying the variables involved in a complex, multi-dimensional problem.
2. Factors associated with non-profit management performance have been clearly identified and defined.
3. Subjective techniques have been developed to quantify the management performance factors.
4. A methodology has been developed and validated that estimates the relationship between variables that was previously unknown.
5. It has been established that simulated annealing heuristic methodology can be applied to measure management performance.

6. The long standing problem of measuring non-profit management performance has been solved using a heuristic approach that provides an acceptable, approximate solution to the measurement of individual management deficiency in an NPA committee member.
7. A positive relationship has been found between age and non-profit management performance. The evidence suggests that as age increases the level of individual management deficiency increases.
8. The most important factors associated with non-profit management performance are management skills, management experience and relevant knowledge. Deficiency in these areas will have a direct impact on individual management deficiency.
9. For smaller NPAs, sound management practices and long term planning are not related to committee management performance.
10. For smaller NPAs, the experience gained from years of serving on the committee, combined with the accumulated knowledge of the association's norms and management processes, forms the means by which the association is managed.

9.5 Recommendations for Future Development and Research

9.5.1 Broadening the Scope of the Model

This study has established that a heuristic model does produce an acceptable, approximate solution to the measurement of management deficiency in smaller NPAs. These smaller NPAs are run entirely by volunteers with committee members required to carry out all of the administrative functions need to run the organisation. A logical next step would be to broaden the scope of the model to make it applicable to larger NPAs that employ staff to carry out some of the administration tasks. Management performance issues to be addressed include committee/staff relations, communication between the committee and staff and increased financial analysis and reporting responsibilities.

9.5.2 Development of an Online Application

After the scope has been broadened, the full potential of the model will be realised when an online application is developed that any NPA can access via the internet. Such an application, with the survey that collects the information completed online, would provide actionable information to an NPA in a simple, timely manner. The model could then become an integral part of an association's management development programme providing the means to instantly assess the effectiveness of the programme at any stage of its implementation. It could also be used to carry out an assessment of the management strengths and weaknesses of potential new recruits to the committee.

9.5.3 The Effect of Age on NPA Management Performance

Age/performance studies in the for-profit sector are criticised for producing results that may not be reliable due to the difficulty in measuring job performance (Maurer & Barbeite 2002). A thorough search of the literature found no references to studies which investigated the relationship between age and management performance in non-profit associations. The results produced by the heuristic model provided the information need to examine the relationship between age and management performance. This study has found that, for volunteer-only NPAs, an old age profile exists with more than 50% of committee members being older than the official retirement age of 65 years. Therefore, medical research suggests that it is much more likely that age related job performance issues exist within NPA committees than in for-profit organisations. A moderate, positive relationship was found to exist between age and individual management deficiency which means that as age increases the level of individual management deficiency increases. This is an area that requires further investigation to determine whether this relationship exists within committee members of larger NPAs.

9.5.4 Measuring Association Performance

NPAs in receipt of government funding are under increasing pressure to demonstrate their performance in delivering the community service that forms their mission (Greatbanks, Elkin & Manville 2010). This pressure has increased the need for a practical, reliable technique to measure the performance of the association in achieving its goals and objectives (Australian Institute of Company Directors 2014, McDonagh 2006). Attempts to measure association performance parallel the situation that existed for measuring non-profit management performance. No single technique has emerged as the preferred approach and there is no agreement as to which set of performance factors should be included in a model (Herman 1990, Moxham 2010, Taysir & Taysir 2012). Many models are criticised for producing unreliable results as an association's mission, and the objectives set to achieve it, are often intangible and difficult to quantify (Heiberg & Bruno-von Vijfeijken 2009, Herman & Renz 2006). As a result, assessing the performance of NPAs remains an area requiring further investigation (Lecy, Schmitz & Swedlund 2011, Willems, Huybrechts, Jegers, Weijters, Vantibborgh, Didee & Pepermans 2012).

The strong relationship between committee performance and association performance has been noted previously in this study. It follows that committee performance would be an important factor in any model to measure association performance. Until now, no simple, reliable technique has been available that could quantify that factor. The successful development the model in this study provides a launch pad from which further research into measuring association performance could be conducted with the heuristic methodology adopted for this study used to solve that long standing measurement problem. As was the case for measuring non-profit management deficiency, an approximate solution would be better than no solution at all.

The development of a model to measure association performance used in tandem with this management deficiency model would make it possible to investigate the link between committee performance and association performance and to identify

the management performance factors that are directly related to association success or failure.

9.6 Conclusion

In Chapter 1 the need to find a reliable measure of management performance in the non-profit sector was established. The lack of success in finding a measurement technique that has wide support was highlighted. This situation led to the formulation of the following research question that this project attempted to answer:

Does heuristic methodology provide an acceptable, approximate solution to the measurement of management deficiency in a non-profit association?

To answer this question the overall objective set for this project was to follow a standard heuristic methodology to build a model that produces an acceptable, approximate solution to the measurement of management deficiency in NPAs. The specific goals that were set to achieve the objective were:

4. Identify and quantify the factors that contribute to management deficiency in NPAs.
5. Use the identified factors to build a heuristic model to measure individual management deficiency in NPAs.
6. Demonstrate that the heuristic model produces an acceptable, approximate solution to the measurement of management deficiency.

A model framework was built to help identify the factors associated with management performance and techniques were developed to quantify the identified factors. A heuristic model to measure individual management deficiency in NPAs was built and statistical tests of significance clearly demonstrated that the results produced by the heuristic model align with a measurement of individual management deficiency obtained by an alternate method. It can be claimed, with a high level of confidence, that the heuristic model produces an acceptable, approximate solution to the measurement of management deficiency in smaller NPAs.

Each of the goals has been met and the objective set for this project has been achieved.

Appendices

Appendix A. Survey Questions

Age

1. Which age group do you belong to?

☐ Less than 65 ☐ 65-69 yrs ☐ 70-74 yrs ☐ 75-79 yrs ☐ 80 yrs or more

Resistance to Change

1. I think it's better to leave things the way they are rather than start changing things.
2. When we are looking for a new person to join the committee, I prefer to appoint a friend.
3. How happy are you to welcome new members into the association?

Commitment

1. How strongly do you feel that this association's problems are your own?
2. How happy are you to spend time working for this association?
3. How important is belonging to this association in your personal life?

Skills

Analytical Skills

1. I am just as interested in financial and administrative matters as I am in the activities we organise.
2. How would you describe your level of interest in monitoring year-to-date income and expenditure?
3. How would you describe your level of interest in your association's financial processes and reporting?
4. When problems arise how would you describe your involvement in the process of finding possible solutions and evaluating options?
5. We always assess the effect of a decision on other areas or other people before implementing it.
6. I would rather worry about what we are doing now than think about what we will be doing in a year's time.
7. How interested are you in thinking about and developing long term plans for the association?

Asset Management

1. How interested are you in managing or looking after your association's physical or financial assets?

Administration Skills

1. Thinking about the different administrative tasks that involve using different computer software and office equipment to produce letters, notices, forms and other documents,
    a. How would you describe your involvement in the development and production of the various documents and reports your association needs?
    b. How often do you help out with the administration work needed to run the association?
2. A copy of the agenda for our committee meetings is always distributed a few days before each meeting?
3. We have a comprehensive induction programme for new committee members in which we are all involved.
4. Our policies and procedures are well documented and distributed to all committee members.
5. How would you describe the programme your association has in place to improve the management skills of your committee?

Organisational Skills

How happy would you feel about each of the following situations?

1. Having to review current management practices to make things run more efficiently?
2. Having to organise or manage an important project, event or activity?

Communication Skills

1. How would you describe your *direct* involvement in the different ways the committee communicates with members and other stakeholders?
2. This committee avoids a lot of confusion and conflict by having good communication with the members.

Social Skills

1. How happy would you feel about having to resolve a dispute between committee members or between the committee and one of the members?
2. There is a sense of cohesion in our committee with everyone working well as a team.
3. How often do you help with the task of developing good relationships with sponsors and other stakeholders?

Experience

1. How many years have you served on the committee of this association or another non-profit association?
2. How many years have you worked in a *management role* in a *for-profit* business or company?
3. Over the past few years how often have you been *in charge of* organising an activity or event?

Knowledge

For each of the following areas, please honestly indicate how well you know and understand them:

1. The objectives that your association has in place to achieve its mission?
2. The financial processes that are followed in your association?
3. The management practices and procedures that are in place to carry out the day to day work of the association?
4. Your association's legal obligations set out in the relevant government legislation?
5. The individual responsibilities of the other committee members and office bearers?

Appendix B. The Postal Survey

Research Survey: Instructions

Thank you for giving up some of your time to participate in this important research project.

Your responses to this questionnaire are completely confidential. All surveys returned will be destroyed after processing.

For each question, select your response from the 1 to 5 scale and mark the box with an X like this: ☒

To change your response, draw a large X through the box you marked then select another response.

Please mark your responses <u>honestly</u>. There is no correct or best answer.

1	Which age group do you belong to?	1 Less than 65 · 2 65-69 · 3 70-74 · 4 75-79 · 5 80 or more
2	I think it's better to leave things the way they are rather than start changing things.	Strongly agree 5 4 3 2 1 Strongly disagree
3	When we are looking for a new person to join the committee I prefer to appoint a friend.	Strongly disagree 1 2 3 4 5 Strongly agree
4	How happy are you to welcome new members into the association?	Extremely happy 5 4 3 2 1 Not at all happy
5	How strongly do you feel that this association's problems are your own?	Not at all strongly 1 2 3 4 5 Very strongly
6	How happy are you to spend time working for this association?	Not at all happy 1 2 3 4 5 Extremely happy
7	How important is belonging to this association in your personal life?	Extremely important 5 4 3 2 1 Not at all important
8	I am just as interested in financial and administrative matters as I am in the events and activities we organise.	Strongly agree 5 4 3 2 1 Strongly disagree
9	How would you describe your level of interest in monitoring year-to-date income and expenditure?	Not at all interested 1 2 3 4 5 Extremely interested
10	How would you describe your level of interest in your association's financial processes and reporting?	Extremely interested 5 4 3 2 1 Not at all interested

There is no correct answer to a question. The best answer is the honest one.

11	When problems arise, how would you describe your involvement in the process of finding possible solutions and evaluating options?	Extremely involved **5 4 3 2 1** Not at all involved
12	We always assess the effect of a decision on other areas or other people before implementing it.	Strongly disagree **1 2 3 4 5** Strongly agree
13	I would rather worry about what we are doing now than think about what we will be doing in a year's time.	Strongly agree **5 4 3 2 1** Strongly disagree

14	How interested are you in thinking about and developing long term plans for the association?	Not at all interested **1 2 3 4 5** Extremely interested
15	How interested are you in managing or looking after your association's physical or financial assets?	Not at all intereste **1 2 3 4 5** Extremely interested

Thinking about the different administrative tasks that involve using different computer software and office equipment to produce letters, notices, forms and other documents,

16	How would you describe your involvement in the development and production of the various documents and reports your association needs?	Extremely involved **5 4 3 2 1** Not at all involved
17	How often do you help out with the administration work needed to run the association?	Never **1 2 3 4 5** Very often

18	A copy of the agenda for our committee meetings is always distributed a few days before each meeting?	Strongly disagree **1** **2** **3** **4** **5** Strongly agree
19	We have a comprehensive induction programme for new committee members in which we are all involved.	Strongly disagree **1** **2** **3** **4** **5** Strongly agree
20	Our policies and procedures are well documented and distributed to all committee members.	Strongly agree **5** **4** **3** **2** **1** Strongly disagree
21	How would you describe the programme your association has in place to improve the management skills of your committee?	Extremely poor **1** **2** **3** **4** **5** Extremely good

For the next 2 questions, please indicate how confident you would feel about each of the following situations:

22	Having to review current management practices to make things run more efficiently.	Not at all confident **1** **2** **3** **4** **5** Extremely confident
23	Having to organise or manage an important project, event or activity.	Extremely confident **5** **4** **3** **2** **1** Not at all confident

24	How would you describe your *direct* involvement in the different ways the committee communicates with members and other stakeholders?	Not at all involved **1** **2** **3** **4** **5** Very involved

Please remember to mark your responses <u>honestly</u>. There is no correct or best answer.

25	This committee avoids a lot of confusion and conflict by having good communication with the members.	Strongly agree **5** **4** **3** **2** **1** Strongly disagree
26	How confident would you feel about having to resolve a dispute between committee members or between the committee and one of the members?	Extremely confident **5** **4** **3** **2** **1** Not at all confident
27	There is a sense of cohesion in our committee with everyone working well as a team and willing to help each other.	Strongly disagree **1** **2** **3** **4** **5** Strongly agree
28	How often do you help with the task of developing good relationships with sponsors and other stakeholders?	Never **1** **2** **3** **4** **5** Very often

29	In total, how many years have you served on the committee of this association or another non-profit association?	**1** 0 - 1 **2** 1 - 2 **3** 2 - 3 **4** 3 - 4 **5** 4 or more
30	How many years have you worked in a *management position* in a *for-profit* business or company?	**1** 0 - 1 **2** 1 - 2 **3** 2 - 3 **4** 3 - 4 **5** 4 or more
31	Over the last few years, how often have you been *in charge of* organising an activity or event?	Never **1** **2** **3** **4** **5** Very often

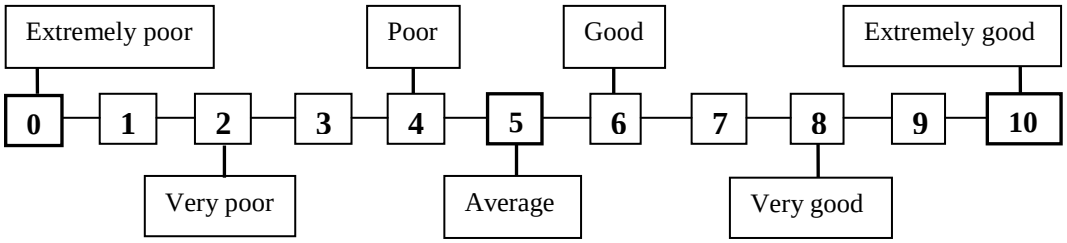
For each of the following areas, please honestly indicate how well you know and understand them:

32	The objectives that your association has in place to achieve its mission.	Extremely well **5** **4** **3** **2** **1** Not at all well
33	The financial processes that are followed in your association.	Not at all well **1** **2** **3** **4** **5** Extremely well
34	The management practices and procedures that are in place to carry out the day to day work of the association.	Extremely well **5** **4** **3** **2** **1** Not at all well
35	Your association's legal obligations set out in the relevant government legislation.	Not at all well **1** **2** **3** **4** **5** Extremely well
36	The individual responsibilities of the other committee members and office bearers.	Extremely well **5** **4** **3** **2** **1** Not at all well

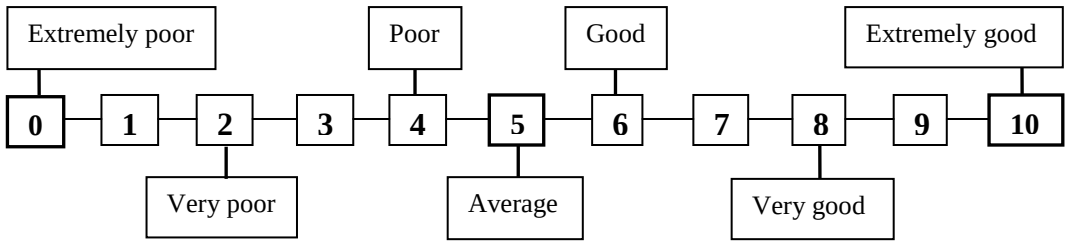
The final question
On a scale of 0 to 10, how would you rate the overall performance of each of the following members of your committee in carrying out their committee member responsibilities, helping organise events and activities and contributing to the running of the association?

Please also rate yourself. Leave blank any position that is vacant.

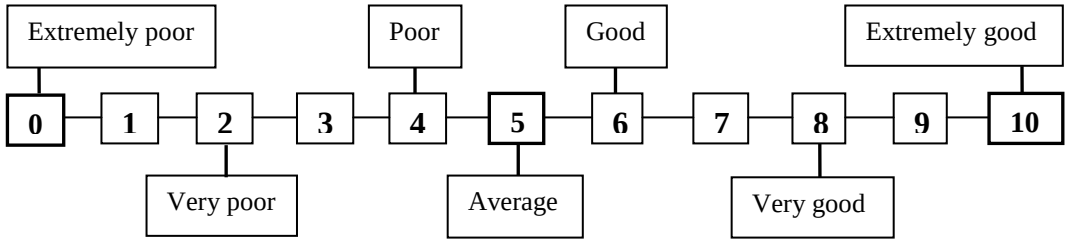
President



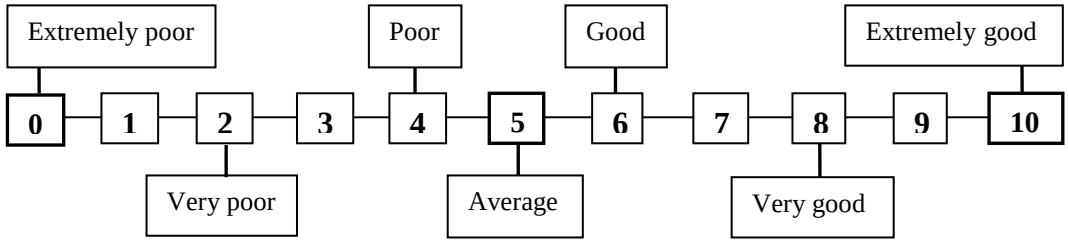
Secretary



Treasurer



Vice-President



Appendix C. Survey Administration Letters

Initial Contact Letter

Dear President,

Your association has been selected to participate in an important research project being conducted through the University of Southern Queensland PhD research programme.

The purpose of the research project is to develop a method to measure management performance across a range of individual factors which can be used by associations like yours to identify management strengths and weaknesses.

Participation is voluntary but if you and three of your fellow committee members are prepared to give a small amount of time to assist, you will be making a valuable contribution to this important area of research.

You will soon receive a survey kit in the mail which contains four copies of the research survey with stamped, return address envelopes, one each for you, the secretary, treasurer and vice-president.

The questionnaire only takes 10 to 15 minutes to complete.

The information collected is treated with strict confidence and the names of individual participants in the project are not required. All questionnaires will be destroyed after data processing and analysis has been completed.

If you require any further information you can contact me on 4125 7978 or send an e-mail to my University of Southern Queensland e-mail address which is u1044570@usq.edu.au .

Yours faithfully,

Laurie Hunt
Research Project Coordinator
University of Southern Queensland

Letter Sent with Survey Kit

Dear President,

I wrote to you earlier to let you know that your association has been selected to participate in an important research project being conducted by the University of Southern Queensland PhD research programme.

The purpose of the research project is to develop a method to measure management performance across a range of factors which can be used by associations like yours to identify management strengths and weaknesses.

Participation is voluntary but if you and three of your fellow committee members are prepared to give a small amount of time to assist, you will be making a valuable contribution to this important area of research.

Enclosed with this letter are four copies of the research survey inside stamped, return address envelopes, one each for you, the secretary, treasurer and vice-president. Could you please distribute these to the committee members indicated on the envelopes for them to complete and return.

The questionnaire only takes 10 to 15 minutes to complete.

The information collected is treated with strict confidence and the names of individual participants in the project are not required. All questionnaires will be destroyed after data processing and analysis has been completed.

In return for your valued assistance, if all four surveys are returned I will send you an analysis of your committee's strengths and weaknesses.

If you require any further information you can contact me on 4125 7978 or send an e-mail to my University of Southern Queensland e-mail address which is u1044570@usq.edu.au .

Yours faithfully,

Laurie Hunt
Research Project Coordinator
University of Southern Queensland

Appendix D. Data Used for the T-test in Section 8.2.1

Table D.1 Model Deficiency Ratios by Association

NPA Code	Respondents							
	1	2	3	4	5	6	Total	Average
ac	0.209	0.127					0.336	0.168
cg	0.044	0.220	0.238	0.388			0.890	0.223
cn	0.209	0.270					0.479	0.240
cd	0.197	0.312					0.509	0.255
az	0.453	0.161	0.210				0.824	0.275
bo	0.183	0.223	0.357	0.488			1.251	0.313
ab	0.186	0.255	0.384	0.483			1.308	0.327
aj	0.255	0.448	0.333				1.036	0.345
aa	0.182	0.418	0.473	0.244	0.383	0.503	2.203	0.367
bz	0.398	0.345					0.743	0.372
bi	0.190	0.402	0.561				1.153	0.384
ba	0.339	0.478	0.259	0.462			1.538	0.385
bn	0.246	0.444	0.491				1.181	0.394
ae	0.260	0.526	0.428	0.459			1.673	0.418
bg	0.426	0.451	0.593	0.236			1.706	0.427

Table D.2 Ratings Deficiency Ratios by Association

NPA Code	Respondents							
	1	2	3	4	5	6	Total	Average
ac	0.250	0.167					0.417	0.209
cg	0.229	0.458	0.208	0.375			1.270	0.318
cn	0.208	0.250					0.458	0.229
cd	0.333	0.375					0.708	0.354
az	0.333	0.167	0.333				0.833	0.278
bo	0.167	0.306	0.167	0.333			0.973	0.243
ab	0.316	0.222	0.194	0.639			1.371	0.343
aj	0.292	0.208	0.500				1.000	0.333
aa	0.417	0.400	0.650	0.283	0.417	0.533	2.700	0.450
bz	0.417	0.417					0.834	0.417
bi	0.194	0.306	0.167				0.667	0.222
ba	0.292	0.271	0.188	0.313			1.064	0.266
bn	0.250	0.167	0.389				0.806	0.269
ae	0.313	0.354	0.292	0.479			1.438	0.360
bg	0.292	0.313	0.333	0.354			1.292	0.323

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