CHAPTER 7: ANAL''SIS OF THE RESEARCH STUDY FINDINGS

7.1 Introduction

This seventh chapter of the the sis is primarily concerned with detailed analysis of the data obtained from the *Best Fi ancial Practice* survey described at length in Chapter 6. The focus is on the two key stu ly relationships in the analytical model for the research presented in Chapter 1. The fir t of these directs attention to the presumed dependence of respondents' financial report ng practices upon certain enterprise and financial management characteristics re presenting the business context, and possibly upon other financial reporting practices. Th e second key study relationship directs attention to the conjectured dependence of ach ieved business growth and performance amongst respondents upon their financi l reporting practices, as well as upon certain enterprise and financial management cha acteristics representing the business context, and possibly upon other growth anc performance outcomes. The goal is to discover whether such dependencies appear to e xist in th e study sample, and their nature and extent. As permitted by the strength and g eneralisability of the findings, inferences may then be made on whether the depende ncies are likely to prevail in the broader population of smaller manufacturers legally o rganised as proprietary companies in Australia.

The chapter first describ es dimensional reduction/structural escalation of the available categorical data emp loying non-linear principal components analysis. This is undertaken separately for the v ariable groupings representing enterprise characteristics, financial management charact eristics and financial reporting practices. The chapter then goes on to describe multivaria e predictive modelling of the key study relationships using logistic regression. Modelling o f financial reporting practices is first presented. Then separate modelling of busines s growth outcomes and business performance outcomes is undertaken. Note that only sta istics considered essential for adequate description and analysis of the research study findings are actually included in this chapter. Some useful additional statistics are incorp orated into Appendix C to the thesis.

7.2 Preliminary Multivariate Data Analysis

7.2.1 Enterprise Characteris ics

In Chapter 5 of the thesis, it is indicated that non-linear principal components analysis has been selected as being th e most appropriate exploratory multivariate statistical technique available in SPSS f or dimen sional reduction/structural escalation of the available categorical data rep esenting enterprise characteristics, financial management characteristics and financial r eporting practices amongst respondents to the *Best Financial Practice* survey. In t his sub-section of the chapter, non-linear principal components analysis is applie d to the 25 enterprise characteristic variables briefly described as follows (in alpha betic order):

- Manufacturing sub-sector of respondent enterprises – nominal study variable ANZSIC with nine categories reflecting specific field of manufacturing.
- Whether or not respondent enterprises have a written business plan extending beyond 12 months into the future – nominal variable study BUSPLAN with two categories reflecting strategic planning.
- Complexity of respondent enterprises' manufacturing operations – nominal study variable COMPLEX with six categories reflecting production technology.
- Extent to which respondents believe that retaining control of an enterprise is preferable to bringing in other equity holders – ordinal study variable CONTROL with five levels reflecting growth constraints.
- Respondent enterprises' number of full-time employee equivalents – ordinal study variable EMPLOYS with five levels reflecting enterprise size.
- Awareness of the business environment amongst respondents – ordinal study variable ENVIRAWR with five levels reflecting strategic management.
- Extent to which respondents believe that access to equity finance is an important constraint on business growth – ordinal study variable EQTACCES with five levels reflecting growth constraints.
- Whether or not respondent enterprises have external directors on their Boards – nominal study variable EXDIRECT with two categories reflecting owner-management.
- Whether or not respondent enterprises have plans for development of export markets in the ensuing two to three years – nominal study variable EXPDEV with two categories reflecting export commitment.
- Whether or not respondent enterprises are already involved in exporting from Australia – nominal study variable EXPORT with two categories reflecting export commitment.
- Extent to which respondents believe that their business performance is largely determined by external influences – ordinal study variable EXTERNAL with five levels reflecting strategic management.
- Extent to which respondents believe that access to finance generally is an important constraint on business growth – ordinal study variable FINACCES with five levels reflecting growth constraints.
- Whether or not respondent enterprises have a formal financial plan or budget – nominal study variable FINPLAN with two categories reflecting strategic planning.
- Extent to which respondent enterprises have experienced difficulties when attempting to raise external finance – nominal study variable FINPROBS with three categories reflecting growth constraints.
- Importance attached by respondent enterprises to business growth as a use of surplus cash – nominal study variable GROWCASH with four categories reflecting growth commitment.

- Importance attached by respondent enterprises to business growth as an organisational objective -- nominal study variable GROWOBJ with four categories reflecting growth commitment.
- Whether or not respondent enterprises have plans for business growth in the ensuing two to three years – nominal study variable GROWPLAN with two categories reflecting growth commitment.
- Extent to which respondents believe that lenders tend to focus on enterprise growth potential rather than upon financial track record – ordinal study variable GROWPOTL with five levels reflecting growth constraints.
- Respondent enterprises' planning horizon for fixed asset investments – ordinal study variable INVHORIZ with six levels reflecting strategic management.
- Importance attached by respondent enterprises to preservation of their owners' life-style as an organisational objective – nominal study variable LIFESTYL with four categories reflecting growth constraints.
- Extent of participation of owners in management of respondent enterprises – ordinal study variable OWNMANAG with three levels reflecting owner-management.
- Whether respondent enterprises are small or medium-sized in employment terms – nominal study variable SME with two categories reflecting enterprise size.
- Geographical location of respondent enterprises – nominal study variable STATE with seven categories reflecting proximity to major population centres.
- Beliefs about the extent of goal orientation and teamwork within respondent enterprises – ordinal study variable STRATEAM with three levels reflecting strategic management.
- Whether or not respondent enterprises have written organisational goals – nominal study variable WRITGOAL with two categories reflecting strategic planning.

It is generally held that in conventional principal components analysis there should be at least five observations, and preferably ten, for each variable (Tabachnick & Fidell, 1989; Hair *et al.*, 1995). In the present situation with 1,050 cases and 25 enterprise characteristic variables, but with some missing data, the ratio appears satisfactory at over 40 observations per variable. In conventional principal components analysis it is customary to check whether there are sufficient statistically significant correlations between variables to make such an analysis worthwhile. Hair *et al.* (1995, p. 374) indicate that 'If visual inspection reveals no substantial number of correlations greater that .30, then [principal components analysis] is probably inappropriate'. Following such a rule in non-linear principal components analysis can be problematic if, as in the present research, there are variables with different measurement levels requiring a variety of correlation coefficients to be used. In conventional principal components

analysis, measures of sampling adequacy are determined for variables individually and collectively. It has already been observed that such measures are not provided in the SPSS implementation of non-linear principal components analysis being used.

In Chapter 5 of the thesis it is indicated that, in non-linear principal components analysis, the number of principal components that should be extracted can be ascertained through their eigen values which, in typical circumstances, need to be greater than the reciprocal of the number of variables (SPSS Inc., 1990). There are 25 enterprise characteristic variables in the analysis, and thus the threshold eigen value for principal components is 0.0400 Using this benchmark, a solution with 11 principal components was initially obtained. However, after the seventh component, interpretation become very difficult, variables are repeated and have relatively low loadings on components, and single variable components begin to appear. Since the interpretability of principal components must ultimately be influential in determining the actual number retained (SPSS Inc., 1990), a decision was made to settle for a seven component solution with eigen values as shown in table below:

Table 7.1: Eigen Values for Enterprise Characteristic Components

Principal Component	Eigen Value	Cumulative Eigen Value
1	0.1234	0.1234
2	0.0772	0.2006
3	0.0748	0.2754
4	0.0657	0.3411
5	0.0561	0.3972
6	0.0538	0.4570
7	0.0489	0.4999

Thus, the seven principal components identified in the final analysis account for about one-half of the total variance amongst the enterprise characteristic variables.

Hair *et al.* (1995, p. 378) indicate that 'in the social sciences, where information is often less precise, it is not uncommon for the analyst to consider a solution that accounts for 60 percent of the total variance (and in some instances even less) as a satisfactory solution'. An informal review of the large number of business research articles gathered during preparation of this thesis, seeking instances of the use of exploratory principal components analysis reported in well regarded journals, conference proceedings, working paper series, etc., revealed no examples of the use of non-linear principal components analysis. However, for conventional principal components analysis, Wood & Goolsby (1987) report extracting six principal components accounting

for 62.0 per cent of variance, Gripsrud (1989) reports extracting three principal components accounting for 50.6 per cent of variance, Sharkey *et al.* (1989) report extracting five principal components accounting for 65.5 per cent of variance, Birley & Westhead (1994) report extracting seven principal components accounting for 60.6 per cent of variance, Baird *et al.* (1994) report extracting three principal components accounting for 63.2 per cent of variance, Dalli (1994) reports extracting two principal components accounting for 57.7 per cent of variance, Ogbuehi & Longfellow (1994) report extracting three principal components accounting for 60.4 per cent of variance, and Lumpkin & Dess (1995) report extracting four principal components accounting for 54.7 per cent of variance.

In the monograph describing an empirical study of managing and controlling Australian family-owned businesses by Moores & Mula (1993), cited extensively in Chapter 3 of the thesis, five separate principal components analyses resulted in extraction of two principal components accounting for 39.3 per cent of variance, three principal components accounting for 31.7 per cent of variance, two principal components accounting for 47.5 per cent of variance, five principal components accounting for 60.8 per cent of variance, and two principal components accounting for 47.3 per cent of variance. The solution obtained from the present non-linear principal components analysis of enterprise characteristic variables might therefore be seen as satisfactory by these relatively undemanding exploratory standards.

Component loadings are calculated in non-linear principal components analysis for all variables. These reflect the strength of associations between the variables and the principal components identified. Loadings of enterprise characteristic variables upon the seven principal components extracted in the final analysis are revealed in Table 7.2 on the next page. In relation to exploratory application of principal components analysis, Ford *et al.* (1986, p. 296) indicate that 'A commonly used rule specifies that only variables with loadings greater that 0.40 on a [component] should be considered "significant" and used in defining that [component]'. In view of this rule, all component loadings greater than 0.400 have been presented in bold in Table 7.2. Note that the variables ENVIRAWR, GROWCASH, GROWOBJ, STATE and STRATEAM do not appear to have 'significant' or meaningful loadings on any principal components.

Based on the known nature of the 20 variables with loadings greater than 0.400, and also the signs of those loadings, the following interpretations are placed on the seven principal components identified in Table 7.2 (in order from 1 to 7):

- Development orientation – variables loading meaningfully on this component are BUSPLAN, FINPLAN, WRITGOAL reflecting strategic planning, INVHORIZ reflecting investment planning horizon, GROWPLAN reflecting growth commitment, EXPORT and EXPDEV reflecting export commitment, and EMPLOYS and SME reflecting enterprise size. Taking account of the construction of these variables and the signs of their component loadings, this component

Table 7.2: Loadings for Enterprise Characteristics

Variable Name	Principal Component Loadings						
	1	2	3	4	5	6	7
ANZSIC	0.214	-0.082	0.050	**0.658**	0.244	0.251	-0.040
BUSPLAN	**-0.592**	0.140	-0.077	0.306	-0.009	-0.315	0.135
COMPLEX	-0.173	0.095	0.026	**-0.621**	-0.181	-0.148	0.100
CONTROL	0.090	0.109	**0.551**	0.035	0.255	-0.231	0.134
EMPLOYS	**0.567**	**0.757**	-0.252	0.095	0.016	0.029	0.187
ENVIRAWR	0.161	0.100	-0.025	-0.087	0.305	0.185	0.144
EQTACCES	-0.209	0.211	**0.622**	-0.006	0.213	-0.080	0.074
EXDIRECT	-0.241	-0.156	0.003	0.147	-0.193	**0.436**	**0.490**
EXPDEV	**-0.567**	0.301	-0.112	-0.327	0.081	0.026	0.154
EXPORT	**0.471**	-0.209	0.082	**0.409**	-0.129	-0.202	-0.240
EXTERNAL	0.249	-0.070	0.160	-0.052	**-0.601**	-0.179	0.127
FINACCES	0.025	0.106	**0.751**	0.065	0.069	0.027	0.134
FINPLAN	**-0.440**	0.024	-0.184	0.362	-0.037	-0.170	0.112
FINPROBS	0.161	0.191	**0.447**	0.010	-0.015	0.107	0.128
GROWCASH	-0.241	0.250	0.254	-0.069	0.038	0.259	-0.302
GROWOBJ	-0.312	0.373	0.094	-0.065	-0.150	0.389	-0.385
GROWPLAN	**-0.522**	0.325	-0.071	0.056	0.047	0.097	-0.148
GROWPOTL	0.160	0.116	0.268	0.125	**-0.580**	-0.058	-0.022
INVHORIZ	**0.426**	0.110	0.002	-0.315	-0.109	-0.135	0.037
LIFESTYL	0.136	0.034	-0.115	-0.096	0.394	**-0.464**	0.199
OWNMANAG	0.121	0.145	-0.009	-0.063	0.181	-0.285	**-0.597**
SME	**0.559**	**0.761**	-0.252	0.097	0.019	0.031	0.190
STATE	0.069	0.063	-0.179	0.034	-0.002	0.266	0.005
STRATEAM	-0.129	0.306	-0.006	0.176	-0.322	-0.200	-0.146
WRITGOAL	**-0.611**	0.107	-0.069	0.312	-0.110	-0.322	0.116

appears to reflect development orientation in terms of how forward looking enterprise management is, what degree of commitment there is to growth, including through exporting, and enterprise size.

- Enterprise size – variables loading meaningfully on this component are EMPLOYS and SME reflecting enterprise size in employment terms. It has been seen that these variables load meaningfully on the first principal component; but their loadings on the second component are considerably stronger. Ford *et al.* (1986, p. 306) point out that 'it is completely consistent with the common factor model and the principle of simple structure for a variable to have more than one high loading'. Taking account of the construction of the significant variables and the signs of their component loadings, the second component appears to reflect how large an enterprise is in employment terms.
- Growth constraints – variables loading meaningfully on this component are business CONTROL, EQTACCES, FINACCES and FINPROBS all reflecting constraints on growth. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect a contrast or tension between wishing to retain control by avoiding external financing and the pressing need for additional funding beyond that of present owners in order to facilitate business growth.
- Technological complexity – variables loading meaningfully on this component are ANZSIC reflecting manufacturing sub-sector and COMPLEX reflecting complexity of manufacturing operations. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect differences in the complexity of technology between manufacturing concerns.
- Business influence – variables loading meaningfully on this component are EXTERNAL reflecting the extent to which business performance is believed to be determined by external influences, and GROWPOTL reflecting the extent to which lenders are believed to focus on enterprise growth potential rather than upon financial track record. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect a contrast or tension between belief that business success is largely internally influenced and belief that outsiders attitudes and behaviours mainly determine business outcomes.
- Life-style preservation - variables loading meaningfully on this component are EXDIRECT reflecting the presence or otherwise of an external director on the Board, and LIFESTYL reflecting the importance attached to preservation of owners' life-style as an organisational objective. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect a contrast or tension between external influences and internal desires regarding owners' life-style ambitions.

- Owner-management – variables loading meaningfully on this component are EXDIRECT reflecting the presence or otherwise of an external director on the Board, and OWNMANAG reflecting the extent of participation of owners in management of their enterprises. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect the degree to which owners have retained for themselves the responsibility for management of their concerns.

Thus it has been possible to usefully interpret the seven principal components extracted in non-linear principal components analysis of the enterprise characteristic variables; and, in so doing, gain insight into potential influences on phenomena of interest to this research. The first principal component is seen as revealing the development orientation of the manufacturing SMEs under study. On the basis of the literature reviewed earlier in the thesis, it might be expected that enterprise development will be more evident where there are written organisational goals, there are plans for business growth in the ensuing two to three years, a written business plan extending beyond 12 months into the future exists, a formal financial plan or budget has been prepared, the fixed asset investment planning horizon is longer, the enterprise presently exports and may have plans for further export market development, and the enterprise is larger in employment terms. In some respects, the availability of this variable compensates for not being able to reliably classify respondent businesses into stages of the Hanks *et al.* (1993) enterprise life-cycle model described in Chapter 2 of the thesis (see the discussion in Chapter 6 on the non-availability of an enterprise age measure in this research).

Object scores (that is, scores for each case) calculated by SPSS on the first principal component have been saved to the datafile as a new continuous study variable DEVELPOR reflecting development orientation within respondent enterprises. Recall from Chapter 5 of the thesis that such object scores have a mean of zero and unit variance. DEVELPOR has a range from –2.21 to 3.07, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed ($D=0.041$, $df=1,050$, $p<0.000$). A Kruskal Wallis one-way analysis of variance suggests that development orientation is statistically higher in larger enterprises in employment terms ($n=1,050$, $H=268.121$, $df=4$, $p<0.000$). Furthermore, a Mann-Whitney test indicates a statistically significant difference in development orientation between small enterprises and medium-sized enterprises in the study sample, with the orientation being higher in medium-sized concerns ($n=1,050$, $U=2,696.000$, $p<0.000$).

The second principal component extracted in the non-linear principal components analysis of enterprise characteristic variables seems to capture enterprise size in employment terms. The extraction of this component, and the inclusion of enterprise size in the first principal component, reinforce the impression gained in the last chapter of the thesis that enterprise size in employment terms has some explanatory potential

for relevant phenomena in the small and medium-sized enterprises investigated. Because of the particular interest in enterprise size in this research, and the need for clarity on its potential influences, it appears most appropriate not to rely on object scores, but simply to use the values of the ordinal variable EMPLOYS to represent the second component. While this is inconsistent with the treatment of other components in the present research, use of a representative variable in this fashion is not unusual in principal components analysis (Dunteman, 1989; Hair *et al.*, 1995). Recall also that the other high loading variable, SME, indicating whether a respondent enterprise is small or medium-sized in employment terms, is actually derived from the variable EMPLOYS.

The third principal component extracted in the non-linear principal components analysis of enterprise characteristic variables appears to reflect a tension between wishing to retain control by avoiding external financing and the pressing need for additional funding beyond that of present owners in order to facilitate business growth. The background literature suggests that business growth is frequently constrained when SMEs refuse to access external funds because of concerns over loss of control and/or increased accountability to others; or where they are not able to access external funds because of an inadequate or poor track record, excessive gearing, a finance gap exists, or some other reason.

Object scores on the third principal component have been saved to the datafile as a new continuous study variable GRWCONST reflecting the severity of growth constraints experienced by respondent enterprises. GRWCONST has a range from –3.92 to 3.11, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed ($D=0.046$, $df=1,050$, $p<0.000$). A Kruskal-Wallis one-way analysis of variance reveals that growth constraints are statistically less severe in larger enterprises in employment terms ($n=1,050$, $H=58.864$, $df=4$, $p<0.000$). Furthermore, a Mann-Whitney test suggests a statistically significant difference in severity of growth constraints between small enterprises and medium-sized enterprises in the study sample, with the severity being less in medium-sized concerns ($n=1,050$, $U=19,552.000$, $p<0.000$). In fact, it is really the contrast between small and medium-sized businesses in terms of the severity of growth constraints that leads to the reported result for the Kruskal-Wallis one-way analysis of variance. An interpretation of this finding is that the medium-sized enterprises in the study sample are hitherto small enterprises that have, in some way, overcome growth constraints facing them.

The fourth principal component extracted in the non-linear principal components analysis of enterprise characteristic variables seems to capture the complexity of technology employed in manufacturing activities. The background literature suggests that, as manufacturing moves towards a wider product range with greater numbers of components, production technology tends to become more complex and imposes greater managerial demands. Interestingly, in addition to study variables indicating manufacturing sub-sector (ANZSIC) and complexity of production technology

(COMPLEX), the nominal study variable EXPORT also loads meaningfully on this principal component. This could reflect the importance of exports from Australia of elaborately transformed manufactures, as identified in Chapter 1 of the thesis.

Object scores on the fourth principal component have been saved to the datafile as a new continuous study variable TECHNOLG reflecting the complexity of the manufacturing technology of respondent enterprises. TECHNOLG has a range from –2.81 to 2.74, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.028, df=1,050, p=0.046). A Kruskal-Wallis one-way analysis of variance indicates that manufacturing technology is statistically more complex in larger enterprises in employment terms (n=1,050, H=13.567, df=4, p=0.009). Furthermore, a Mann-Whitney test reveals a statistically significant difference in technological complexity between small enterprises and medium-sized enterprises in the study sample, with the complexity being greater in medium-sized concerns (n=1,050, U=30,480.000, p=0.001). Again, it really seems to be a significant difference between small and medium-sized enterprises that drives the results of both statistical tests.

The fifth principal component extracted in the non-linear principal components analysis of enterprise characteristic variables appears to reflect a contrast between belief that business success is largely internally influenced and belief that outsiders attitudes and behaviours mainly determine business outcomes. Those SME owner-managers with confidence in their ability to influence the future of their ventures could be described as having self-reliance or empowerment in a business sense. They may be less likely to attribute the success or failure of their concerns to external events, organisations or individuals. Such traits are often associated in the relevant literature with the entrepreneurial personality (McMahon *et al.*, 1993a).

Object scores on the fifth principal component have been saved to the datafile and their signs reversed to form a new continuous study variable BUSINFLU reflecting apparent self-reliance or empowerment in business matters within respondent enterprises. BUSINFLU has a range from –2.91 to 4.22, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.042, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance suggests that business influence is statistically unrelated to enterprise size in employment terms (n=1,050, H=6.969, df=4, p=0.138). Furthermore, a Mann-Whitney test indicates no statistically significant difference in business influence between small enterprises and medium-sized enterprises in the study sample (n=1,050, U=38,726.000, p=0.977).

The sixth principal component extracted in the non-linear principal components analysis of enterprise characteristic variables seems to capture a tension between external influences and internal desires regarding owners' life-style ambitions. The background literature suggests that SME owner-managers can and frequently do rank preservation of their life-style as a relatively important organisational objective, and that

this may significantly constrain business growth and performance. The presence of an external director on the Board, possibly representing the interests of external financiers, may effectively limit owner-managers' ability to indulge their life-style wishes.

Object scores on the sixth principal component have been saved to the datafile as a new continuous study variable LIFPRSRV reflecting the degree of preservation of owners' life-style within respondent enterprises. LIFPRSRV has a range from –3.16 to 3.76, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is normally distributed (D=0.026, df=1,050, p=0.091). A Kruskal-Wallis one-way analysis of variance reveals that life-style preservation is statistically unrelated to enterprise size in employment terms (n=1,050, H=5.245, df=4, p=0.263). Furthermore, a Mann-Whitney test suggests no statistically significant difference in life-style preservation between small enterprises and medium-sized enterprises in the study sample (n=1,050, U=36,437.000, p=0.365).

The seventh and last principal component extracted in the non-linear principal components analysis of enterprise characteristic variables appears to reflect the extent to which owners have retained for themselves the responsibility for management of their concerns. The background literature suggests that this will diminish as SMEs grow and professional managers are appointed for day-to-day operational support as owner-managers' role becomes more strategic in its emphasis. The presence of an external director on the Board also becomes more likely as small and medium-sized enterprises grow, especially if growth has been financed with external funds.

Object scores on the seventh principal component have been saved to the datafile as a new continuous study variable OWNERMNG reflecting the degree of owner-management in respondent enterprises. OWNERMNG has a range from –3.88 to 2.44, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D= 0.058, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance indicates that owner-management is statistically related to enterprise size in employment terms (n=1,050, H=50.971, df=4, p<0.000). Furthermore, a Mann-Whitney test reveals that a statistically significant difference in owner-management exists between small enterprises and medium-sized enterprises in the study sample (n=1,050, U=22,327.000 p<0.000). Initially, as expected, the extent of owner-managership seems to decrease with increasing enterprise size in employment terms. But then owner-managership increases quite markedly for medium-sized concerns in the study sample. The reason for this pattern is not immediately evident, although it does parallel contrasts between small and medium-sized enterprises noted on some earlier principal components (see GRWCONST and TECHNOLG). It may be that a strong owner influence in day-to-day management is important for growth to the point of being a successful medium-sized enterprise.

In closing this sub-section of the chapter, it is interesting to broadly examine associations between the principal components derived from the enterprise

characteristic variables. Bear in mind that these associations are not expected to be very marked because the principal components have been specifically extracted in a manner that ensures they are orthogonal. Because of its size, a correlation matrix for the enterprise characteristic components is presented in Appendix C to the thesis (see *C5 Associations Amongst Enterprise Characteristic Components*). Only four statistically significant associations are evident in the matrix of 21 substantive correlations, the largest of which in absolute terms is 0.341 between development orientation and enterprise size in employment terms. Certainly, there is no indication that multicollinearity between these independent variables is likely to be a problem in logistic regression modelling.

7.2.2 Financial Management Characteristics

In this sub-section of the chapter, non-linear principal components analysis is applied to the 44 financial management characteristic variables for respondents to the *Best Financial Practice* survey, briefly described as follows (in alphabetic order):

- Whether or not respondent enterprises provide annual historical financial statements to their financiers – nominal study variable ANSTMFIN with two categories reflecting financial reporting to financiers.
- Type of budgeting system in use amongst respondent enterprises – nominal study variable BUDGSYS with four categories reflecting financial systems.
- Whether or not respondent enterprises have provided a business plan to their financiers – nominal study variable BUSPLFIN with two categories reflecting financial reporting to financiers.
- Whether or not respondent enterprises have changed their bankers in the preceding two years – nominal study variable CHGBANK with two categories reflecting financier relationships.
- Ratio of debt to equity in the balance sheets of respondent enterprises – ordinal study variable DTERATIO with five levels reflecting business financing.
- Whether or not employees are involved in budgeting for respondent enterprises – ordinal study variable EMPLBUDG with three levels reflecting internal financial advice.
- Whether or not employees are kept informed about the financial status of respondent enterprises - ordinal study variable EMPLFINS with three levels reflecting internal financial advice.
- Experience of respondent enterprise in attempting to raise finance for business acquisitions – ordinal study variable FINACQ with three levels reflecting business financing.
- Experience of respondent enterprise in attempting to raise finance for additional capacity – ordinal study variable FINADCAP with three levels reflecting business financing.

- Extent to which responde nts believe their businesses are thoroughly understood by the internal and extern al financial advisers they use – ordinal study variable FINADVUN with five leve s reflecting internal and external financial advice.
- Whether or not responde nt enterprises submit their financial systems and reports to a financial audit – nom nal study variable FINAUDIT with two categories reflecting financial audit.
- Experience of responden enterpr se in attempting to raise finance for new products – ordinal study variable FINEWPRD with three levels reflecting business financing.
- Experience of responder t enterprise in attempting to raise finance to replace existing capacity – ordin l study variable FINEXCAP with three levels reflecting business financing.
- Experience of responder t enterprise in attempting to raise finance for export purposes – ordinal study variable FINEXPOR with three levels reflecting business financing.
- Experience of responder t enterprise in attempting to raise finance to meet needs not otherwise identified - ordinal study variable FINOTHER with three levels reflecting business finan cing.
- Experience of responden nt enterprise in attempting to raise finance for permanent working capital – ordinal study variable FINPERWC with three levels reflecting business financing.
- Experience of responde nt enterprise in attempting to raise finance for research and development purpo ses – ordinal study variable FINRD with three levels reflecting business finar cing.
- How recently, if at all, e ternal debt and/or equity finance has been sought by respondent enterprises - ordinal study variable FINSEEK with four levels reflecting business finar cing.
- Number of staff involve l in the internal finance function of respondent enterprises – ordinal study variable FINSTAFF with six levels reflecting internal financial advice.
- Experience of respond nt enterprise in attempting to raise finance for start-up purposes – ordinal stud / variable FINSTUP with three levels reflecting business financing.
- Experience of respond nt enterprise in attempting to raise finance for temporary working capital – ordin l study variable FINTMPWC with three levels reflecting business financing.
- Extent to which owners of respondent enterprises make key financial decisions themselves – ordinal study variable FMDECID with three levels reflecting financial decision-maki ng.

- Frequency with which respondent enterprises review their financial systems and practices – ordinal study variable FMREVIEW with five levels reflecting financial systems review.
- Degree of satisfaction amongst respondent enterprises with their financial practices – ordinal study variable FMSATISF with five levels reflecting financial systems review.
- Whether or not respondent enterprises provide future-oriented financial statements to their financiers – nominal study variable FOSTMFIN with two categories reflecting financial reporting to financiers.
- Type of general ledger accounting system in use amongst respondent enterprises – nominal study variable GLACCSYS with four categories reflecting financial systems.
- Whether or not respondent enterprises have been refused finance because they have submitted insufficient financial information – nominal study variable INSFININ with two categories reflecting financial reporting to financiers.
- Whether or not financiers are kept informed of significant issues by respondent enterprises – nominal study variable ISSUEFIN with two categories reflecting financier relationships beyond formal financial reporting.
- Whether or not respondent enterprises have been asked to supply more financial information than they initially provided in support of their most recent loan application – nominal study variable MOREINFO with two categories reflecting financial reporting to financiers.
- Whether or not respondent enterprises provide periodic historical financial statements to their financiers at least quarterly – nominal study variable PRSTMFIN with two categories reflecting financial reporting to financiers.
- Whether or not internal finance staff of respondent enterprises have received recent training on accounting software – nominal study variable TRNACCSW with two categories reflecting internal financial advice.
- Whether or not internal finance staff of respondent enterprises have received recent training on financial accounting – nominal study variable TRNFINAC with two categories reflecting internal financial advice.
- Whether or not internal finance staff of respondent enterprises have received recent training on management accounting – nominal study variable TRNMANAC with two categories reflecting internal financial advice.
- Extent to which respondents believe financial management of their manufacturing businesses is understood by financiers – ordinal study variable UNDSTFIN with five levels reflecting internal and external financial advice.
- Extent to which respondents believe operational management of their manufacturing businesses is understood by financiers – ordinal study variable UNDSTOPS with five levels reflecting internal and external financial advice.

- Whether or not financiers have visited the factory premises of respondent enterprises – nominal study variable VISITFIN with two categories reflecting financier relationships beyond formal financial reporting.
- Whether or not respondent enterprises seek advice from external professionals on accounting matters – nominal study variable XADVACCA with two categories reflecting external financial advice.
- Whether or not respondent enterprises seek assistance from external professionals with preparation of financial reports – nominal study variable XADVACCP with two categories reflecting external financial advice.
- Whether or not respondent enterprises seek assistance from external professionals with implementation of new accounting systems – nominal study variable XADVACCS with two categories reflecting external financial advice.
- Whether or not respondent enterprises seek audits from external professionals – nominal study variable XADVAUDT with two categories reflecting external financial advice.
- Whether or not respondent enterprises engage external professionals for business planning and advice – nominal study variable XADVBUSP with two categories reflecting external financial advice.
- Whether or not respondent enterprises seek assistance from external professionals with preparation of loan applications – nominal study variable XADVLOAN with two categories reflecting external financial advice.
- Whether or not respondent enterprises engage external professionals for consultation on taxation matters – nominal study variable XADVTAX with two categories reflecting external financial advice.
- Whether or not respondent enterprises seek assistance from external professionals with year-end tax and accounting matters – nominal study variable XADVYEND with two categories reflecting external financial advice.

With 1,050 cases and 44 financial management characteristic variables, there are potentially over 20 observations per variable. Even though there are missing values, this ratio appears satisfactory by the sample size benchmarks for principal components analysis mentioned earlier.

With 44 financial management characteristic variables in the non-linear principal components analysis, the threshold eigen value for principal components becomes 0.0227. Initial trials indicated that, using this benchmark, a solution with an absurdly high number of principal components would be obtained. After some experimentation, a decision was made to settle for a seven component solution with eigen values as shown in Table 7.3 on the next page. The seven principal components identified in the final analysis account for just over half of the total variance amongst the enterprise characteristic variables. This is slightly better than the explanatory power of the non-linear principal components analysis of enterprise characteristic variables reported

Table 7.3: Eigen Values for Financial Management Characteristic Components

Principal Component	Eigen Value	Cumulative Eigen Value
1	0.1153	0.1153
2	0.0977	0.2130
3	0.0872	0.3002
4	0.0714	0.3716
5	0.0627	0.4343
6	0.0563	0.4906
7	0.0519	0.5425

earlier. Again, the solution obta ned from the present non-linear principal components analysis of financial manageme nt characteristic variables might be seen as satisfactory by relatively undemanding expl oratory standards.

Loadings of financial ma nagement characteristic variables upon the seven principal components extractec in the final analysis are revealed in Table 7.4 on the next two pages. As with the ear lier non-linear principal components analysis of enterprise characteristic variab es, all component loadings greater than 0.400 have been presented in bold in Table 7.4. Note that the variables BUDGSYS, CHGBANK, EMPLBUDG, EMPLFINS, FINACQ, FINADVUN, FINOTHER, FMDECID, FMREVIEW, FMSATISF, GLACCSYS and MORINFO do not appear to have 'significant' or meaningful loadings on any pri ncipal components.

Based on the known nat ure of the 32 variables with loadings greater than 0.400, and also the signs of those loa dings, the following interpretations are placed on the seven principal components id entified in Table 7.4 (in order from 1 to 7):

- Financial reporting clima te – variables loading meaningfully on this component are ANSTMFIN, BUSPL FIN, FOSTFIN and PRSTMFIN reflecting financial reporting to financiers, ISSUEFIN and VISITFIN reflecting relationships with financiers beyond financ al reporting, FINAUDIT and XADVAUDT reflecting external audit of financia l statements, and FINSTAFF, TRNFINAC and TRNMANAC reflecting i nternal financial advice. The component loading of TRNACCSW, also refle ting internal financial advice, is only very slightly lower than the threshold of 0.400. Taki ng account of the construction of these variables and the signs of their co nponent loadings, this component appears to reflect how adverse circumstances are to financial reporting for internal financial management purposes.

Table 7.4: Loadings for Financial Management Characteristics

Variable Name	Principal Component Loadings						
	1	2	3	4	5	6	7
ANSTMFM	**0.574**	(.106	-0.076	**-0.520**	-0.080	-0.035	-0.161
BUDGSYS	-0.386	-0).110	-0.279	-0.270	0.102	0.072	0.124
BUSPLFIN	**0.679**	(.010	-0.052	-0.376	-0.005	-0.154	-0.143
CHGBANK	0.128	-).184	0.047	-0.051	-0.017	0.308	0.057
DTERATIO	-0.382	(.193	-0.221	0.107	0.193	**-0.588**	0.105
EMPLBUDG	0.227	(.145	0.080	0.127	0.022	-0.205	0.162
EMPLFINS	0.233	-).039	0.025	0.136	-0.111	-0.173	0.097
FINACQ	0.098	-).357	0.064	0.015	0.191	-0.065	-0.047
FINADCAP	0.156	**-).661**	0.103	0.084	0.199	-0.255	0.010
FINADVUN	0.344	).242	-0.377	0.173	0.397	-0.113	0.008
FINAUDIT	**0.463**	).083	0.187	0.147	-0.102	-0.027	**0.934**
FINEWPRD	0.094	**-0.600**	0.086	0.085	0.268	-0.272	-0.055
FINEXCAP	0.125	**-0.560**	0.112	0.033	0.179	-0.123	0.030
FINEXPOR	0.109	**-0.480**	0.046	0.022	0.169	-0.153	0.004
FINOTHER	0.067	-0.231	-0.033	0.091	0.071	-0.128	-0.079
FINPERWC	0.060	**-0.674**	0.081	0.032	0.136	-0.079	0.008
FINRD	0.008	**0.624**	0.048	0.146	0.185	-0.187	0.070
FINSEEK	0.204	0.298	0.319	0.142	-0.079	**0.954**	-0.050
FINSTAFF	**-0.505**	0.189	-0.348	-0.280	0.145	-0.069	-0.112
FINSTUP	0.121	**0.435**	-0.009	0.014	0.130	-0.106	0.044
FINTMPWC	0.097	**-0.640**	0.033	0.029	0.146	0.019	-0.004
FMDECID	-0.212	-0.114	-0.358	-0.077	0.034	-0.035	-0.168
FMREVIEW	0.246	0.154	-0.052	0.123	-0.001	-0.137	-0.162
FMSATISF	0.127	0.350	-0.200	0.112	0.398	-0.383	0.026
FOSTMFIN	**-0.715**	0.074	-0.044	**-0.428**	0.054	-0.058	-0.105

Table 7.4 (cont.): Loadings for Financial Management Characteristics

Variable Name	Principal Component Loadings						
	1	2	3	4	5	6	7
GLACCSYS	-0.372	-(.006	-0.303	-0.253	0.154	0.048	0.197
INSFININ	0.155	**-(.611**	0.121	0.021	0.101	0.208	0.011
ISSUEFIN	**0.696**	(.028	0.001	**-0.498**	0.034	-0.075	-0.105
MOREINFO	0.085	-().082	0.067	-0.036	-0.075	0.363	-0.022
PRSTMFIN	**0.664**	-().030	0.038	-0.270	-0.009	-0.101	-0.014
TRNACCSW	0.398	(.085	-0.057	**0.649**	-0.129	-0.068	-0.246
TRNFINAC	**0.438**	().150	0.038	**0.659**	-0.127	-0.097	-0.310
TRNMANAC	**0.416**	().135	0.017	**0.701**	-0.158	-0.111	-0.304
UNDSTFIN	0.218	().307	-0.352	0.160	**0.884**	0.347	0.087
UNDSTOPS	0.194	).292	-0.355	0.152	**0.865**	0.392	0.076
VISITFIN	**0.626**	).114	-0.044	**-0.527**	-0.014	-0.021	-0.167
XADVACCA	0.046	-0.200	**-0.702**	0.001	-0.302	-0.020	0.090
XADVACCP	-0.046	-0.181	**-0.611**	-0.047	-0.173	0.067	0.028
XADVACCS	0.154	0.234	**-0.622**	0.221	-0.136	0.144	-0.011
XADVAUDT	**0.487**	).027	0.010	0.156	-0.160	-0.025	**0.889**
XADVBUSP	0.286	0.127	**-0.560**	0.169	-0.204	0.145	-0.113
XADVLOAN	0.216	-0.251	**-0.602**	0.132	-0.135	0.192	-0.066
XADVTAX	0.078	-0.083	**-0.606**	0.056	-0.342	0.004	0.172
XADVYEND	-0.062	-0.170	**-0.637**	-0.100	-0.242	-0.083	0.103

- Financing problems – variables loading meaningfully on this component are FINADCAP, FINEWPRD, FINEXCAP, FINEXPOR, FINPERWC, FINRD, FINSTUP and FINTMPWC all reflecting business financing, and INSFININ reflecting whether or not finance has been refused because insufficient financial information has been submitted. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect having experienced difficulties with external financing.
- External financial advice – variables loading meaningfully on this component are XADVACCA, XADVACCP, XADVACCS, XADVBUSP, XADVLOAN, XADVTAX

and XADVYEND all reflecting external financial advice. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect dependence on outside professionals, usually public accountants, for advice on a range of financial matters.

- Financier reporting burden – variables loading meaningfully on this component are ANSTMFIN and FOSTMFIN reflecting financial reporting to financiers, ISSUEFIN and VISITFIN reflecting relationships with financiers beyond financial reporting, and TRNACCSW, TRNFINAC and TRNMANAC reflecting recent training of internal finance staff. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect the extent of accountability to external financiers through and beyond formal financial reports, possibly without skilled internal financial staff. Note that, despite a superficial resemblance, this component differs from the first principal component as far as signs of loadings for variables ANSTMFIN, FOSTMFIN, ISSUEFIN and VISITFIN are concerned. The first component is oriented towards circumstances where there is low accountability to external financiers, whereas this fourth principal component is oriented towards circumstances of high accountability.
- Financial management support – variables loading meaningfully on this component are UNDSTFIN and UNDSTOPS reflecting beliefs in respondent enterprises about financiers' understanding of financial and operational aspects of manufacturing businesses. There are two variables with loadings on this principal component only very slightly lower than the threshold of 0.400. These are FINADVUN indicating the extent to which respondents believe their businesses are thoroughly understood by the internal and external financial advisers they use; and FMSATISF indicating the degree of satisfaction amongst respondents with their financial practices. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect the degree of general dissatisfaction with financial management support received by respondent enterprises.
- Funding independence - variables loading meaningfully on this component are DTERATIO reflecting the ratio of debt to equity in the balance sheets of respondent enterprises, and FINSEEK reflecting how recently, if at all, external debt and/or equity finance has been sought. Taking account of the construction of these variables and the signs of their component loadings, this component appears to reflect relative independence from externally provided funds.
- External audit – variables loading meaningfully on this component are FINAUDIT and XADVAUDT reflecting external audit of financial statements. Taking account of the construction of these variables and the signs of their component loadings,

this component appears to reflect absence of external scrutiny of financial statements through financial audits.

Thus it has been possible to usefully interpret the seven principal components extracted in non-linear principal components analysis of the financial management characteristic variables; and, in so doing, gain insight into potential influences on phenomena of interest to this research. The first principal component is seen as revealing how adverse the climate in the manufacturing SMEs under study is towards financial reporting for internal financial management purposes. On the basis of the literature reviewed earlier in the thesis, it might be expected that financial reporting to owner-managers and managerial employees will be less evident where there is little or no financial reporting to financiers, there is little contact with financiers outside of formal financial reporting, there is no imperative to produce externally audited financial statements, there are relatively few internally employed finance staff, and those who are employed have little recent training on accounting software and in financial and management accounting.

Object scores for the first principal component have been saved to the datafile and their signs reversed to form a new continuous study variable FRCLIMAT reflecting how conducive the climate is to financial reporting within respondent enterprises. FRCLIMAT has a range from -4.33 to 2.58, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed ($D=0.043$, $df=1,050$, $p<0.000$). A Kruskal-Wallis one-way analysis of variance suggests that the financial reporting climate is statistically better in larger enterprises in employment terms ($n=1,050$, $H=141.577$, $df=4$, $p<0.000$). Furthermore, a Mann-Whitney test indicates a statistically significant difference in financial reporting climate between small enterprises and medium-sized enterprises in the study sample, with the climate being better in medium-sized concerns ($n=1,050$, $U=18,940.000$, $p<0.000$).

The second principal component extracted in the non-linear principal components analysis of financial management characteristic variables appears to reflect experience of having difficulties with external financing, including being rejected for supplying too little financial information in support of a funding request. The background literature suggests that smaller and younger enterprises are more likely to experience external financing problems, and that a finance gap may exist for such concerns as far as medium- to long-term development capital is concerned.

Object scores on the second principal component have been saved to the datafile as a new continuous study variable EXFINPRB reflecting the level of problems experienced with external financing by respondent enterprises. EXFINPRB has a range from –2.58 to 7.20, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed ($D=0.150$, $df=1,050$, $p<0.000$). A Kruskal-Wallis one-way analysis of variance reveals that the level of external financing problems experienced is statistically lower in larger enterprises in employment terms ($n=1,050$,

H=43.769, df=4, p<0.000). Furthermore, a Mann-Whitney test suggests a statistically significant difference in the level of external financing problems experienced between small enterprises and medium-sized enterprises in the study sample, with the level being lower in medium-sized concerns (n=1,050, U=29,062.000, p<0.000).

The third principal component extracted in the non-linear principal components analysis of financial management characteristic variables seems to capture dependence on outside professionals, usually public accountants, for advice on a range of financial matters. The background literature suggests this dependence will be higher in smaller enterprises that frequently cannot afford to employ their own internal finance staff. Object scores on the third principal component have been saved to the datafile as a new continuous study variable EXADVICE reflecting the level of dependence on external financial advice amongst respondent enterprises. EXADVICE has a range from –4.87 to 3.56, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.150, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance indicates that dependence on external financial advice is statistically lower in larger enterprises in employment terms (n=1,050, H=75.539, df=4, p<0.000). Furthermore, a Mann-Whitney test reveals a statistically significant difference in dependence on external financial advice between small enterprises and medium-sized enterprises in the study sample, with the dependence being lower in medium-sized concerns (n=1,050, U=23,624.000, p<0.000).

The fourth principal component extracted in the non-linear principal components analysis of financial management characteristic variables appears to reflect the extent of accountability respondent enterprises have to external financiers through and beyond formal financial reports, possibly without skilled internal financial staff to assist. The background literature suggests that this financier reporting burden could be greater in relative terms amongst smaller SMEs without long track records in business that seek external financing for development purposes.

Object scores on the fourth principal component have been saved to the datafile as a new continuous study variable FINACCNT reflecting the financier reporting burden of respondent enterprises. FINACCNT has a range from –4.19 to 2.71, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.045 df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance suggests that financier reporting burden is statistically lower in larger enterprises in employment terms (n=1,050, H=24.029, df=4, p<0.000). Furthermore, a Mann-Whitney test indicates a statistically significant difference in financier reporting burden between small enterprises and medium-sized enterprises in the study sample, with the burden being lower in medium-sized concerns (n=1,050, U=31,766.000, p=0.007).

The fifth principal component extracted in the non-linear principal components analysis of financial management characteristic variables seems to capture the degree

of general dissatisfaction with financial management support received by respondent enterprises. The background literature provides limited guidance on this matter. A poor opinion amongst SME owner-managers of financiers generally is not uncommon given the difficulty many such concerns reportedly experience gaining external finance on what are considered to be acceptable terms. Relatively low regard for accounting professionals and para-professionals is also not uncommon in smaller businesses, especially in light of what are considered to be high costs of their services.

Object scores for the fifth principal component have been saved to the datafile and their signs reversed to form a new continuous study variable FMSUPPRT reflecting the level of satisfaction amongst respondent enterprises with available financial management support. FMSUPPRT has a range from –3.95 to 5.20, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.060, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance reveals that satisfaction with financial management support is statistically lower in larger enterprises in employment terms (n=1,050, H=14.610, df=4, p=0.006). However, a Mann-Whitney test suggests no statistically significant difference in satisfaction with financial management support between small enterprises and medium-sized enterprises in the study sample (n=1,050, U=34,927.000, p=0.137).

The sixth principal component extracted in the non-linear principal components analysis of financial management characteristic variables appears to reflect relative independence from externally provided funds. The background literature suggests that many SME owner-managers shun external debt and/or equity financing in order to avoid accountability to others, and because of concern about loss of control. On the other hand, because of the limited resources of their owners, small and medium-sized enterprises that aim to grow typically have high dependence on external financing.

Object scores for the sixth principal component have been saved to the datafile and their signs reversed to form a new continuous study variable EXFINDEP reflecting the level of dependence amongst respondent enterprises upon external funding. EXFINDEP has a range from -4.74 to 3.42, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.101, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance indicates that dependence on external financing is statistically unrelated to enterprise size in employment terms (n=1,050, H=5.175, df=4, p=0.270). Furthermore, a Mann-Whitney test reveals no statistically significant difference in dependence on external financing between small enterprises and medium-sized enterprises in the study sample (n=1,050, U=36,231.000, p=0.324).

The seventh and last principal component extracted in the non-linear principal components analysis of financial management characteristic variables seems to reflect the absence of external scrutiny of financial statements, typically through financial audits. The background literature suggests that financial reporting is likely to be less

prevalent, and probably less reliable, where audited financial statements are not required to be produced by some imperative such as meeting obligations to financiers, satisfying corporations regulation legislation, etc.

Object scores for the seventh principal component have been saved to the datafile and their signs reversed to form a new continuous study variable EXTAUDIT reflecting the level of external scrutiny of financial statements of respondent enterprises. EXTAUDIT has a range from -3.20 to 3.29, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.082, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance suggests that the incidence of external scrutiny of financial statements is statistically unrelated to enterprise size in employment terms (n=1,050, H=8.932, df=4, p=0.063). However, a Mann-Whitney test indicates a statistically significant difference in external scrutiny of financial statements between small enterprises and medium-sized enterprises in the study sample, with such scrutiny being more likely in medium-sized concerns (n=1,050, U=32,418.000, p=0.014).

It is interesting to broadly examine associations between the principal components derived from the financial management characteristic variables. Again, bear in mind that these associations are not expected to be very marked because the principal components have been specifically extracted in a manner that ensures they are orthogonal. Because of its size a correlation matrix for the financial management components is presented in Appendix C to the thesis (see *C6 Associations Amongst Financial Management Components*). Only five statistically significant associations are evident in the matrix of 21 substantive correlations, the largest of which in absolute terms is -0.175 between financier reporting burden and financial reporting climate. Certainly, there is no indication that multicollinearity between these independent variables is likely to be a problem in logistic regression modelling.

In closing this sub-section of the chapter, it is interesting to also examine associations between the principal components derived from the enterprise characteristic variables and those derived from the financial management characteristic variables. This time, of course, the associations could be substantial because the two groups of components have been extracted in separate analyses. Because of its size, a correlation matrix for the enterprise characteristic and financial management components is presented in Appendix C to the thesis (see *C7 Associations Amongst Enterprise and Financial Management Components*). There are 32 statistically significant associations evident in the matrix of 49 substantive correlations, but the largest of these in absolute terms is just 0.306 between development orientation and financial reporting climate. Once more, there is no indication that multicollinearity between these independent variables is likely to be a problem in logistic regression modelling.

7..2.3 Financial Reporting Practices

In an exploratory research study such as this it would be overly ambitious (and tedious) to attempt to separately discover significant associations for each and every financial reporting practice being investigated. Rather, it is considered more appropriate to endeavour to develop an overall indication of the extent or comprehensiveness of the various financial reporting practices undertaken in respondent enterprises. This is certainly the approach taken in comparable studies in the area such as those of Holmes & Nicholls (1989), Holmes *et al* (1989), Holmes *et al.* (1991a), McMahon & Davies (1991a, 1991b, 1992a, 1992b), McMahon *et al.* (1992a, 1992b), Moores & Mula (1993), McMahon & Davies (1994), and McMahon *et al.* (1994a). Various means were considered for building a rating variable that captures the overall level of financial reporting practices, including essentially naïve scoring of each case in the data file on the basis of values for the key financial reporting practice variables described in Chapter 6 of the thesis. Ultimately, it was decided to use non-linear principal components analysis to provide a more sophisticated financial reporting measure.

Thus, in this sub-section of the chapter, non-linear principal components analysis is applied to the 11 financial reporting practice variables for respondents to the *Best Financial Practice* survey, briefly described as follows:

- Whether or not an historical balance sheet is available and used by respondent enterprises – nominal study variable HISTBS with three categories reflecting historical financial reporting practices.
- Whether or not an historical profit and loss statement is available and used by respondent enterprises - nominal study variable HISTPL with three categories reflecting historical financial reporting practices.
- Whether or not an historical cash-flow statement is available and used by respondent enterprises - nominal study variable HISTCF with three categories reflecting historical financial reporting practices.
- Frequency of regular use of historical profit and loss statements within respondent enterprises – ordinal study variable FQREVPL with six levels reflecting historical financial reporting practices.
- How frequently the cash position of respondent enterprises is regularly assessed – ordinal study variable CASHPOSN with five levels reflecting historical financial reporting practices.
- Whether or not some future-oriented financial statements are likely to be obtained by respondent enterprises – nominal study variable FORPRTS with two categories reflecting financial budgeting practices.
- Whether or not future-oriented cash-flow statements are likely to be obtained by respondent enterprises – nominal study variable CASHREQ with four categories reflecting cash-flow forecasting practices.

- Horizon for future-oriented cash-flow statements – ordinal study variable CSHRQHOR with four levels reflecting cash-flow forecasting practices. Notice that this study variable has been modified by discarding the category 'Other', and focusing only on those respondents indicating a specific horizon for cash-flow forecasting. This allows the variable to be appropriately treated as ordinal in measurement level, rather than nominal as it was presented in Chapter 6.
- Whether or not benchmarking is known about and employed by respondent enterprises – nominal study variable BENCHMRK with 4 categories reflecting possible use of financial ratios in historical financial statement analysis.
- Frequency with which budget comparisons of forecast versus actual results are regularly carried out within respondent enterprises – ordinal study variable FQBUDCOM with six levels reflecting use of such comparisons in historical financial statement analysis. Notice that this study variable has been modified by discarding the category 'Irregularly', and focusing only on those respondents regularly undertaking budget comparisons. This allows the variable to be appropriately treated as ordinal in measurement level, rather than nominal as it was presented in Chapter 6.
- Whether or not regular forecast versus actual comparisons for cash-flows are undertaken by respondent enterprises – nominal study variable CFBUDCOM with two categories reflecting use of such comparisons in historical financial statement analysis.

With 1,050 cases and 11 financial reporting practice variables, there are potentially over 95 observations per variable. Even though there are missing values, this ratio appears satisfactory by the sample size benchmarks for principal components analysis mentioned earlier.

In using non-linear principal components analysis to gain an overall indication of the comprehensiveness of financial reporting practices in respondent enterprises, the SPSS statistical software was forced to produce one principal component only. This single component has an eigenvalue of 0.2432, and thus accounts for about one-quarter of the total variance amongst the financial reporting practice variables. Generally speaking, this is a quite normal explanatory level for a first principal component (Tabachnick & Fidell, 1989; Hair *et al.*, 1995). Loadings of the financial reporting practice variables upon the principal component extracted are revealed in Table 7.5 on the next page. Notice that, with the possible exception of CSHRQHOR, all of the financial reporting practice variables load substantially on the single principal component extracted. As the figures in bold indicate, more than one-half of the loadings across the range of financial reporting practices exceed the benchmark of 0.400 established earlier. All but one of the other loadings exceed 0.300. Taking account of the construction of the financial reporting practice variables and the signs of their component loadings, this component appears to capture conveniently and with some

Table 7.5: Loadings for Financial Reporting Practices

Variable Name	Principal Component Loadings
HISTBS	**-0.679**
HISTPL	**-0.727**
HISTCF	-0.344
FQREVPL	**-0.419**
CASHPOSN	-0.373
FORPRTS	**-0.532**
CASHREQ	**-0.689**
CSHRQHCR	0.219
BENCHMRK	-0.381
FQBUDCCM	**-0.422**
CFBUDCCM	-0.354

integrity the overall extent or comprehensiveness of financial reporting practices undertaken by SMEs in the *Best Financial Practice* survey.

Object scores for the principal component extracted have been saved to the datafile to form a new continuous study variable FRINDEX reflecting the comprehensiveness of financial reporting practices undertaken by respondent enterprises. FRINDEX has a range from –5.46 to 1.57, and a Kolmogorov-Smirnov one-sample test with Lilliefors correction shows that it is non-normally distributed (D=0.129, df=1,050, p<0.000). A Kruskal-Wallis one-way analysis of variance reveals that financial reporting practices are more comprehensive in larger enterprises in employment terms (n=1,050, H=135.554, df=4, p< 0.000). Furthermore, a Mann-Whitney test suggests a statistically significant difference in the comprehensiveness of financial reporting practices between small enterprises and medium-sized enterprises in the study sample, with these practices being more extensive in medium-sized concerns (n=1,050, U=18,772.000, p<0.000).

In closing this sub-section of the chapter, it is interesting to examine associations between the financial reporting practice variable FRINDEX and the principal components derived earlier from the enterprise and financial management characteristic variables, as revealed in Table 7.6 on the next page. Two comments seem appropriate on the associations shown in the table. First, there are nine statistically significant correlations between the financial reporting practice variable FRINDEX and variables

Table 7.6: Associations Between Financial Reporting and Business Context

Variable Name	Kendall's tau b	Statistical Significance (p)	Number of enterprises
BUSINFLU	-0.040	0.053	1,050
DEVELPOR	0.325	<0.000	1,050
EMPLOYS	0.261	<0.000	1,050
GRWCONST	0.060	0.003	1,050
LIFPRSRV	0.038	0.066	1,050
OWNERMNG	-0.046	0.026	1,050
TECHNOLG	-0.112	<0.000	1,050
EXADVICE	-0.136	<0.000	1,050
EXFINDEP	0.032	0.116	1,050
EXFINPRB	-0.079	<0.000	1,050
EXTAUDIT	-0.015	0.455	1,050
FINACCNT	-0.132	<0.000	1,050
FMSUPPRT	-0.039	0.060	1,050
FRCLIMAT	0.335	<0.000	1,050

representing the business context. The weak associations with development orientation, enterprise size in employment terms and financial reporting climate, in particular, suggest these as possible explanatory variables for logistic regression modelling of financial reporting practices. Second, there is no indication that multicollinearity between the financial reporting practice variable FRINDEX and any business context variables is likely to be a problem when they are later jointly used as independent variables in logistic regression modelling of business growth and performance outcomes.

7.2.4 Preliminary Multivariate Data Analysis Summary

The non-linear principal components analyses conducted for the relatively large number of enterprise and financial management characteristic variables representing the business context for this research can be viewed as having been very useful in that principal components have emerged that are not really unexpected, but which hitherto were unobservable influences in the data. This has certainly reinforced understanding of the underlying dynamics of the business context. However, it must be acknowledged that the proportion of variability in the enterprise and financial management characteristics explained by the principal components extracted is somewhat limited.

Using the words of Dalli (1994, p. 101), it would seem that the business context variables in this study are 'characterized by a high level of indeterminacy and serendipity'.

The seven principal components extracted and interpreted in non-linear principal components analysis of the 25 enterprise characteristic variables are:

- Development orientation
- Enterprise size
- Growth constraints
- Technological complexity
- Business influence
- Life-style preservation
- Owner-management

The emergence and apparent significance of these principal components accords well with background literature for the study, and they collectively account for one-half of the observed variability in the enterprise characteristic variables.

The seven principal components extracted and interpreted in non-linear principal components analysis of the 44 financial management characteristic variables are:

- Financial reporting climate
- Financing problems
- External financial advice
- Financier reporting burden
- Financial management support
- External funding dependence
- External audit

The emergence and apparent significance of these principal components accords well with background literature for the study, and they collectively account for a little over one-half of the observed variability in the financial management characteristic variables.

Overall then, dimensional reduction/structural escalation of data has been achieved in that the number of variables describing the business context for the study has been statistically reduced using non-linear principal components analysis from 69 initial variables that obviously capture all of the variance in the data set to 14 variables capturing around one-half of the variance amongst the original variables. Furthermore, the remaining 14 variables are relatively non-associated, and they seem to have integrity and meaning when viewed in the light of the background literature reviewed earlier in the thesis. For a research area like business, in which causation is almost inevitably multifactorial, and in which few simple technical, economic or managerial relationships exist, this might be seen as a modest but worthwhile achievement.

Non-linear principal components analysis has also proved most useful for devising a measure of the overall extent or comprehensiveness of financial reporting practices undertaken by SMEs in the *Best Financial Practice* survey – thus reducing the number of

financial reporting practice variables to be dealt with in multivariate predictive modelling from 11 to one. The measure captures one-quarter of the variability in the original financial reporting practice variables and, to the extent that nearly all of the initial variables load substantially and appropriately on the principal component extracted, the measure obtained is not only convenient but also has integrity.

Finally, non-linear principal components analysis of enterprise and financial management characteristic variables has provided further support for the perception that enterprise size in employment terms has some explanatory potential for relevant phenomena in the small and medium-sized enterprises investigated. Statistically significant associations with enterprise size in employment terms are evident in data reported for the following principal components:

- Development orientation
- Growth constraints
- Technological complexity
- Owner-management
- Financial reporting climate
- Financing problems
- External financial advice
- Financier reporting burden
- Financial management support
- External audit
- Comprehensiveness of financial reporting practices

Also of particular interest are the sharp contrasts that have emerged between small and medium-sized enterprises in terms of growth constraints, technological complexity, owner-management and external audit.

7.3 Multivariate Predictive Modelling

7.3.1 Financial Reporting Practices

In Chapter 5 of the thesis, it is indicated that logistic regression has been selected as the most useful predictive modelling methodology appropriate to the categorical and/or irregularly distributed dependent and independent variables obtained through the research instrument for the *Best Financial Practice* survey. The focus in this sub-section of the chapter is on the first key study relationship in the analytical model for the research presented in Chapter 1 of the thesis:

$$\mathbf{R_m = f(E_s, F_t, R_o)} \qquad \text{Eqn 7.1}$$

where R_m = financial reporting practices, notionally dependent variables

E_s = enterprise characteristics, notionally independent variables

F_t = financial management characteristics, notionally independent variables

R_o = other financial reporting practices, notionally covariates

Together, the enterprise and financial management characteristics of respondents constitute the business context. The broad intention is to reveal through logistic regression modelling which business context characteristics seem most influential on the comprehensiveness of financial reporting practices adopted by manufacturing SMEs in the study sample.

In order to facilitate logistic regression modelling with the comprehensiveness of financial reporting practices as the dependent variable, the continuous study variable FRINDEX derived using non-linear principal components analysis earlier in this chapter has been built upon/modified as follows:

- Respondent enterprises have been classified into three groups according to whether they are in the first, second or third tercile of the financial reporting measure FRINDEX. Thus, a new ordinal study variable FRGRPT has been formed with three categories corresponding to low, intermediate and high levels for the comprehensiveness of financial reporting practices.
- The study variable FRGRPT has been converted into two dichotomised study variables FRGRPT1 and FRGRPT2. The first of these new variables indicates whether or not financial reporting practices are at a low level. The second new variable indicates whether or not financial reporting practices are at a high level.

As anticipated in Chapter 5 of the thesis, these variable conversions have been undertaken in order to permit polytomous logistic regression to be approximated via two dichotomous logistic regressions. The conversions are such that cumulative logits are obtained which reflect the ordinal nature of the financial reporting practice variable FRGRPT.

Broadly following the recommendations of Hosmer & Lemeshow (1989) and Norusis & SPSS Inc. (1992c), the procedure followed in logistic regression modelling of financial reporting practices involved:

- For each level of the dependent variable, first building a model with a constant and all 14 enterprise and financial management characteristics as independent variables. Backward stepwise elimination based on the Likelihood Ratio test with an elimination criterion of α=0.05 and a subsequent re-entry criterion of α=0.01 was then used to produce the most parsimonious model with statistically significant parameters for each level of the dependent variable.
- Although approximating polytomous logistic regression in the manner chosen permits models for each level of the dependent variable to include different independent variables, this facility is not available in true polytomous logistic regression. For this reason, and because it produces models that are easier to interpret, independent variables not in the most parsimonious model for both levels of the dependent financial reporting variable were eliminated and the models refitted. Checks were then made that the statistical significance of model

parameters and goodness-of-fit of the models were not seriously undermined by the eliminations. This proved to be the case.

- Models were then built with forced entry of the remaining independent variables and backward elimination from inclusion of all possible two-way interactions between the remaining independent variables. The interactions terms proved not to be statistically significant and were therefore eliminated automatically or were not present in the most parsimonious models for both levels of the dependent financial reporting variable and were therefore eliminated manually.

Specifications for the final models obtained through this procedure are presented in the table below:

Table 7.7: Logistic Regression Models for Financial Reporting Practices

Dependent Variable	Fitted Model (with n=1,050)	Odds Ratio	Odds Ratio Bounds[a]		Statistical Significance[b]	
			Lower	Upper	Parameter	Fitted Model
FRGRPT1 (Low vs Intermediate + High)	0.9345				0.0000	
	+0.6237DEVELPOR	1.8657	1.5678	2.2204	0.0000	
	-0.1688OWNERMNG	0.8447	0.7272	0.9811	0.0271	
	-0.3588TECHNOLG	0.6985	0.6042	0.8074	0.0000	
	-0.2214EXADVICE	0.8014	0.7036	0.9128	0.0009	
	+0.4938FRCLIMAT	1.6385	1.4274	1.8809	0.0000	0.0000
FRGRPT2 (Low + Intermediate vs High)	-0.7967				0.0000	
	+0.6035DEVELPOR	1.8285	1.5389	2.1726	0.0000	
	-0.2061OWNERMNG	0.8137	0.7050	0.9392	0.0048	
	-0.2048TECHNOLG	0.8148	0.7047	0.9421	0.0057	
	-0.2718EXADVICE	0.7620	0.6720	0.8641	0.0000	
	+0.6721FRCLIMAT	1.9548	1.6654	2.3029	0.0000	0.0000

[a] Bounds are 95 per cent confidence limits.
[b] Probability for the appropriate significance test. For individual parameters this is a Wald test. For the fitted model this is a Likelihood Ratio test comparing the 'constant only' model with the fitted model.

Notice that all model parameters for both levels of the dependent financial reporting variable are statistically significant, and both models are statistically significant overall.

The logistic regression models presented suggest that the comprehensiveness of financial reporting practices undertaken by respondents to the *Best Financial Practice* survey is mainly influenced by five groupings of explanatory factors:

- Those reflecting development orientation such as how forward looking enterprise management is, what degree of commitment there is to growth, including through exporting, and enterprise size. Thus, while enterprise size in employment terms is not separately included in the logistic regression models for financial reporting practices, the variables EMPLOYS and SME do nevertheless influence the model through their substantial loadings on the principal component representing

development orientation. The sign of the coefficient for the variable DEVELPOR in each model is positive suggesting that the comprehensiveness of financial reporting practices increases with increasing development orientation. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

Considering the model with FRGRPT1 as dependent variable, the odds ratio for development orientation suggests the likelihood that financial reporting practices will be at an intermediate or high level is increased by a multiplicative factor of 1.8657 for each unit increase in the variable DEVELPOR. For the model with FRGRPT2 as dependent variable, having financial reporting practices at a high level appears 1.8285 times more likely for each unit increase in the variable DEVELPOR. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that development orientation genuinely influences the comprehensiveness of financial reporting practices.

- Those reflecting the degree to which owners have retained for themselves the responsibility for management of their concerns. The sign of the coefficient for the variable OWNERMNG in each model is negative, suggesting that the comprehensiveness of financial reporting practices necessarily increases with decreasing day-to-day involvement of owner-managers; and is possibly also influenced by the increasing possibility of there being an external director on the Board. Again, this is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

  Considering the model with FRGRPT1 as dependent variable, the odds ratio for the degree of owner-management suggests the likelihood that financial reporting practices will be at an intermediate or high level is decreased by a multiplicative factor of 0.8447 for each unit increase in the variable OWNERMNG. For the model with FRGRPT2 as dependent variable, having financial reporting practices at a high level appears 0.8137 times less likely for each unit increase in the variable OWNERMNG. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that degree of owner-management genuinely influences the comprehensiveness of financial reporting practices.

- Those reflecting differences in the complexity of technology between respondent manufacturing concerns. The sign of the coefficient for the variable TECHNOLG in each model is negative, suggesting that the comprehensiveness of financial reporting practices decreases with increasing technological complexity. This direction of influence is the reverse of that anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier. The only explanation that can be offered for this finding is the possibility that owner-

managers of SMEs utilising advanced technologies tend to rely more on technical indicators of business position and performance, rather than the financial measures which appear in accounting reports.

Considering the model with FRGRPT1 as dependent variable, the odds ratio for the complexity of technology suggests the likelihood that financial reporting practices will be at an intermediate or high level is decreased by a multiplicative factor of 0.6985 for each unit increase in the variable TECHNOLG. For the model with FRGRPT2 as dependent variable, having financial reporting practices at a high level appears 0.8143 times less likely for each unit increase in the variable TECHNOLG. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that the complexity of technology genuinely influences the comprehensiveness of financial reporting practices.

- Those reflecting the degree of dependence amongst respondent enterprises upon outside professionals, usually public accountants, for advice on a range of financial matters. The sign of the coefficient for the variable EXADVICE in each model is negative, suggesting that the comprehensiveness of financial reporting practices decreases with increasing dependence on external financial advisers. Remembering that smaller enterprises frequently cannot afford to employ their own internal finance staff and therefore tend to be more dependent on outside financial advice, this is the direction of influence anticipated for this financial management characteristic on the basis of the background literature reviewed earlier.

  Considering the model with FRGRPT1 as dependent variable, the odds ratio for the degree of dependence upon external financial advice suggests the likelihood that financial reporting practices will be at an intermediate or high level is decreased by a multiplicative factor of 0.8014 for each unit increase in the variable EXADVICE. For the model with FRGRPT2 as dependent variable, having financial reporting practices at a high level appears 0.7620 times less likely for each unit increase in the variable EXADVICE. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that degree of dependence upon external financial advice genuinely influences the comprehensiveness of financial reporting practices.
- Those reflecting how conducive the climate in the manufacturing SMEs under study is towards financial reporting for internal financial management purposes. The sign of the coefficient for the variable FRCLIMAT in each model is positive, suggesting that the comprehensiveness of financial reporting practices increases with increasing conduciveness of the financial reporting climate. This is the

direction of influence anti ipated for this financial management characteristic on the basis of the backgrou id literature reviewed earlier.

Considering the model wi h FRGRPT1 as dependent variable, the odds ratio for conduciveness of the fina ncial reporting climate suggests the likelihood that financial reporting practic es will be at an intermediate or high level is increased by a multiplicative factor of .6385 for each unit increase in the variable FRCLIMAT. For the model with FRGF PT2 as dependent variable, having financial reporting practices at a high level a ppears 1.9584 times more likely for each unit increase in the variable FRCLIMA T. Notice that the 95 per cent confidence intervals for these odds ratios do not nclude 1.0000 – reinforcing the impression that conduciveness of the fina ncial reporting climate genuinely influences the comprehensiveness of fi nancial reporting practices.

Of the variable groupings ident fied, development orientation and financial reporting climate seem to be the most in luential upon the comprehensiveness of financial reporting practices of respondent enterprises. However, more parsimonious models including just these two explan atory factors proved to be noticeably inferior to the models presented in Table 7.7. Thus, the recommendation of Hosmer & Lemeshow (1989, p. 111) that 'one err in the direction of selecting a relatively rich model following stepwise selection' has been fc llowed.

Attention now turns to hc w well the models chosen are able to predict the comprehensiveness of financia l reporting practices employed by respondents to the *Best Financial Practice* survey given the relevant enterprise and financial management characteristics. In other words, the important consideration is the goodness-of-fit between observed extents of f nancial reporting practices in the study sample and predictions made using the mc dels. Some summary measures of goodness-of-fit for the logistic regression models in T able 7.7 are presented in the table below:

Table 7.8: Good ness-of-Fit for Financial Reporting Models

Dependent Variable	Hosmer & Lemeshow Goodnes s-of-Fit Test	Cox & Snell R^2	Nagelkerke R^2
FRGRPT1	χ^2=6.401 2, df=8, p=0.6014	0.200	0.278
FRGRPT2	χ^2=9.902 3, df=8, p=0.2719	0.236	0.325

The Hosmer & Lemeshow sta istic is a chi-square measure calculated for a contingency table in which the rows are ca egories of the dependent variable and the columns are deciles of probabilities of the v arious outcomes for the dependent variable (sometimes referred to as 'deciles of risk') If the model being evaluated is a good fit with the data, the observed number of case s in each cell should be approximately equal to the expected number based on th e model A Chi-Square test is carried out with degrees of freedom equal to the number of deciles into which estimated probabilities available from

the model fall minus two. The null hypothesis tested is that the observed and expected frequencies are identical, and therefore the model being evaluated is a good fit with the data. Clearly, this null hypothesis cannot be rejected for either model in the table above.

The Cox & Snell and Nagelkerke measures in Table 7.8 may be loosely viewed as logistic regression counterparts to the well known R^2 statistic in linear regression analysis. It is important to note, however, that the goodness-of-fit they reflect is between two models examined in a Likelihood Ratio test; and not between a model and observed data as is the case in linear regression. These measures always fall between 0 and 1, and they tend to be much lower than the R^2 statistic in linear regression analysis (Steinberg & Colla, 1991). Apparently, a low number does not necessarily imply a poor fit, and values between 0.20 and 0.40 are considered very satisfactory. Because they are susceptible to misinterpretation, Hosmer & Lemeshow (1989) recommend against use of such pseudo-R^2 measures. Nevertheless, it is encouraging to observe that, for both models in Table 7.8, the Cox & Snell and Nagelkerke R^2 measures appear satisfactory.

Another available means for assessing the goodness-of-fit for logistic regression models is through their classification success. Classification is usually achieved by assigning each case to the dependent variable category for which the estimated probability exceeds 0.5 according to the model being evaluated. The statistics of interest include the proportion of classifications that are correct by dependent variable category, and overall. It is also useful to have some measure of classification success for each dependent variable category showing the gain of the model over a 'constant only' model that assigns the same probability, equal to the observed proportion of the total sample in each category, to every case in the data set. Finally, a comparison of the overall classification success with an arbitrary benchmark of 50 per cent correct may be of interest (Peel & Peel, 1988).

Classification success for a logistic regression model can be determined for the original sample from which the model has been developed, for a sample withheld from the original data set, or for an entirely new set of data. On the need for validation of a logistic regression model with data other than that from which it has been developed, Hosmer & Lemeshow (1989, p. 171) comment as follows:

> The reason for considering this type of assessment of model performance is that the fitted model always performs in an optimistic manner on the developmental data set.

In the present exploratory context, classification success has been evaluated only for the original development/learning/modelling sample. No external validation has been undertaken using data from an entirely separate source because such data were not available. This, of course, becomes a limitation of the predictive modelling stage of the research.

Some summary measures of classification success for the logistic regression models in Table 7.7 are presented in Table 7.9 on the next page. Knowing that the

Table 7.9: Classification Success for Financial Reporting Models

Dependent Variable	Financial Reporting Level	Observed Proportion (per cent)	Predicted Correctly (per cent)	Gain (percentage points)	Overall Predicted Correctly (per cent)
FRGRPT1	Low	33.33	48.57	15.24	
	Intermediate + High	66.67	86.43	19.76	73.81
FRGRPT2	Low + Intermediate	65.03	87.03	22.00	
	High	34.67	50.00	15.33	74.19

statistics presented in the table are more than likely optimistic reflections of the reliability of the models chosen, they might nevertheless be described cautiously as fairly encouraging. For both financial reporting outcomes in both models, classification success appears to be some 15 to 20 percentage points better than a 'constant only' model which assigns probabilities equal to the observed proportions in the sample to each dependent variable category. Note that the gain is poorest for the least represented categories. Hosmer & Lemeshow (1989, p. 147) observe that:

> Classification is sensitive to the relative sizes of the two component groups and will always favour classification into the larger group, a fact that is also independent of the fit of the model.

Logistic regression is not a technique designed to find an optimal trade-off between Type 1 and Type 2 errors (Ohlson, 1980). For both logistic regression models, the overall classification success noticeably exceeds an arbitrary cut-off of being 50 per cent correct.

In closing this sub-section of the chapter, it can be observed that logistic regression modelling, with underpinning from non-linear principal components analysis, has been extremely useful in addressing the first part of the principal research question for this study: discovering which enterprise and financial management characteristics seem to most influence financial reporting practices adopted in small and medium-sized manufacturing enterprises legally organised as proprietary companies in Australia. The explanatory factors for the comprehensiveness of financial reporting practices that have emerged in the models generally make business sense and sit well with prior scholarly knowledge in the area. Furthermore, the logistic regression models developed provide a convenient and practically useful means of revealing the individual and combined influences of these explanatory factors upon financial reporting practices. More is said on this in Chapter 8 of the thesis.

7.3.2 Business Growth

The focus in this sub-section of the chapter and the next is on the second key study relationship in the analytical model for the research presented in Chapter 1 of the thesis:

$$Y_p = f(R_m, E_s, F_t, Y_n) \qquad \text{Eqn 7.2}$$

where Y_p = business growth and performance outcomes, notionally dependent variables

R_m = financial reporting practices, notionally independent variables

E_s = enterprise characteristics, notionally covariates

F_t = financial management characteristics, notionally covariates

Y_n = other business growth and performance outcomes, notionally covariates

The outcomes of interest in this sub-section are those involving business growth. The financial reporting practices of concern are those with an historical or a future orientation, as well as analysis and interpretation of historical financial statements. Together, the enterprise and financial management characteristics of respondents constitute the business context. The broad intention is to reveal through logistic regression modelling which of the independent variables identified seem most influential on achieved business growth amongst manufacturing SMEs in the study sample.

In this sub-section of the chapter, logistic regression modelling is undertaken separately for two dependent variables representing business growth outcomes for respondents to the *Best Financial Practice* survey, briefly described as follows:

- Sales trends over the last 12 months for respondent enterprises – ordinal study variable SLSGROWP initially with five levels reflecting business growth in terms of past sales growth. This variable has been converted into two dichotomised study variables SLSGRWPD1 and SLSGRWPD2. The first of these new variables indicates whether or not actual growth in sales has taken place over the last 12 months. The second new variable indicates whether or not strong growth in sales (10 per cent or more) has taken place over the last 12 months.
- Anticipated sales trends over the ensuing 12 months for respondent enterprises – ordinal study variable SLSGROWF initially with five levels reflecting business growth in terms of future sales growth. This variable has been converted into two dichotomised study variables SLSGRWFD1 and SLSGRWFD2. The first of these new variables indicates whether or not growth in sales is expected to take place over the ensuing 12 months. The second new variable indicates whether or not strong growth in sales (10 per cent or more) is expected to take place over the ensuing 12 months.

In part, the variable conversions described have been undertaken to deal with low numbers of responses for some initial levels of the dependent variables. As anticipated in Chapter 5 of the thesis, the variable conversions have also been undertaken in order to permit polytomous logistic regression to be approximated via two dichotomous logistic regressions for each initial sales growth variable. The conversions are such that cumulative logits are obtained which reflect the ordinal nature of the sales growth variables.

Before proceeding, it is useful to examine associations between the dichotomous sales growth variables described above. Because of its size, a correlation matrix for all

business growth measures used as dependent variables during predictive modelling in this research is presented in Appendix C to the thesis (see *C8 Associations Amongst Business Growth and Performance Variables*). The six substantive correlations between the past sales growth variables and the future sales growth variables are all statistically significant, the largest correlation coefficient being 0.555 between the incidence of strong sales growth in the past and the expectation of strong sales growth in the future. Recall from Chapter 6 of the thesis that there is a moderate, statistically significant association between sales growth over the last 12 months as measured by study variable SLSGROWP and anticipated sales growth for the ensuing 12 months as measured by study variable SLSGROWF (n=998, Kendall's tau b=0.487, p<0.000). Altogether, this evidence suggests that past sales growth should be considered as an independent variable in logistic regression modelling of expected future sales growth.

While 18 of the 32 substantive associations between the sales growth variables and the business performance variables are statistically significant, all but two are very weak. There is an indication that having profitability greater than that of competitors is weakly associated with strong past sales growth (with correlation coefficient 0.222) and expectation of strong sales growth in the future (with correlation coefficient 0.226). Past sales growth as reflected by ordinal study variable SLSGROWP is associated in a statistically significant manner with greater profitability as revealed by ordinal study variable PROFITAB (n=786, Kendall's tau b=-0.213, p<0.000). Furthermore, anticipated future sales growth as reflected by ordinal study variable SLSGROWF is associated in a statistically significant manner with greater profitability as revealed by ordinal study variable PROFITAB (n=743, Kendall's tau b=-0.141, p<0.000). Altogether, this evidence suggests that profitability relative to that of competitors should be considered as an independent variable in logistic regression modelling of past sales growth and expected future sales growth.

As a final preliminary before logistic regression modelling of past sales growth, it is useful to examine bivariate evidence of associations between this outcome and the continuous study variable FRINDEX reflecting the comprehensiveness of financial reporting practices undertaken by respondent enterprises. A Kruskal-Wallis one-way analysis of variance with SLSGROWP as the grouping variable indicates that the comprehensiveness of financial reporting practices is statistically greater in enterprises that have recently grown more strongly in sales revenue terms (n=1,050, H=12.149, df=4, p=0.016). A Mann-Whitney test with SLSGRWPD1 as the grouping variable reveals a statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that have recently grown in sales revenue terms and those which have not, with the former having more extensive financial reporting practices (n=1,050, U=104,482.000, p=0.003). Finally, a Mann-Whitney test with SLSGRWPD2 as the grouping variable suggests a statistically significant difference in the comprehensiveness of financial reporting practices between

respondent enterprises that have recently grown strongly in sales revenue terms and those which have not, with the former having more extensive financial reporting practices (n=1,050, U=113,412.000, p=0.016). Altogether, these findings establish that the comprehensiveness of financial reporting practices has some potential as an explanatory factor for past sales growth of manufacturing concerns in the study sample.

Modelling of past sales growth amongst respondents to the *Best Financial Practice* survey, with the dichotomous study variables SLSGRWPD1 and SLSGRWPD2 as dependent variables, broadly followed the procedure set down in the previous sub-section of the chapter. However, the initial full model prior to undertaking backward stepwise elimination of independent variables contained, besides a constant, all 14 enterprise and financial management characteristics, the continuous study variable FRINDEX capturing the comprehensiveness of financial reporting practices, and the dichotomous study variables PROFITD1 and PROFITD2 indicating profitability relative to that of competitors. Specifications for the final models obtained are presented in the table below:

Table 7.10: Logistic Regression Models for Past Sales Growth

Dependent Variable	Fitted Model (with n=786)	Odds Ratio	Odds Ratio Bounds[a]		Statistical Significance[b]	
			Lower	Upper	Parameter	Fitted Model
SLGRWPD1 (No growth vs Growth)	0.8006				0.0000	
	+0.5839DEVE_POR	1.7930	1.4654	2.1937	0.0000	
	-1.3127SME	0.2691	0.1281	0.5653	0.0005	
	-0.2451GRWCONST	0.7826	0.6568	0.9326	0.0061	
	+0.1606EXFINDEP	1.1742	1.0286	1.3405	0.0174	
	+0.7379PROFITD2	2.0916	1.3997	3.1256	0.0003	0.0000
SLGRWPD2 (No strong growth vs Strong growth)	-0.8372				0.0000	
	+0.6300DEVE_POR	1.8777	1.5372	2.2936	0.0000	
	-1.6074SME	0.2004	0.0964	0.4167	0.0000	
	-0.1700GRWCONST	0.8436	0.7140	0.9968	0.0458	
	+0.1796EXFINDEP	1.1967	1.0494	1.3647	0.0074	
	+0.9171PROFITD2	2.5020	1.7744	3.5278	0.0000	0.0000

[a] Bounds are 95 per cent confidence limits.
[b] Probability for the appropriate significance test. For individual parameters this is a Wald test. For the fitted model this is a Likelihood Ratio test comparing the 'constant only' model with the fitted model.

The reduced number of cases used in modelling is due to missing values for some variables employed. Notice that all model parameters for both levels of the dependent past sales growth variable are statistically significant, and both models are statistically significant overall.

The first observation to make on the logistic regression models presented is that, despite the statistically significant bivariate associations noted earlier, past sales growth does not appear to depend in a multivariate setting on the comprehensiveness of

financial reporting practices undertaken by respondent enterprises. This finding obviously calls for further comment later in the thesis. The second observation to make is that the logistic regression models suggest past sales growth is mainly influenced by five groupings of explanatory factors:

- Those reflecting development orientation such as how forward looking enterprise management is, what degree of commitment there is to growth, including through exporting, and enterprise size. The sign of the coefficient for the variable DEVELPOR in each model is positive, suggesting that the strength of past sales growth increases with increasing development orientation. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

  Considering the model with SLSGRWPD1 as dependent variable, the odds ratio for development orientation suggests the likelihood of sales growth is increased by a multiplicative factor of 1.7930 for each unit increase in the variable DEVELPOR. For the model with SLSGRWPD2 as dependent variable, experiencing strong sales growth appears 1.8777 times more likely for each unit increase in the variable DEVELPOR. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that development orientation has genuinely influenced the strength of past sales growth.
- Those reflecting enterprise size in employment terms, beyond their indirect influence through the study variable DEVELPOR just considered. The ordinal study variable EMPLOYS was initially entered into logistic regression models for past sales growth as a categorical independent variable. However, of the four design variables produced by the SPSS statistical software for this independent variable, only that distinguishing small enterprises from medium-sized enterprises proved to be statistically significant in models developed. Accordingly, EMPLOYS was replaced with the dichotomous study variable SME indicating whether respondent enterprises are small or medium-sized in employment terms.

  The sign of the coefficient for the variable SME in each model is negative, suggesting that the strength of past sales growth decreases when manufacturing concerns become medium-sized. This represents some form of plateau in sales growth for medium-sized concerns which could be a straightforward size effect as sales growth is figured from a larger sales base. Alternatively, this may reveal deliberate restrictions on sales growth imposed by owner-managers once their businesses become medium-sized – evidence of what is referred to in earlier chapters of the thesis as capped growth. This phenomenon could also plausibly be the result of externally imposed constraints on sales growth, such as limited

access to longer-term growth or development finance – evidence of what has been referred to as a finance gap.

Considering the model with SLSGRWPD1 as dependent variable, the odds ratio for SME suggests the likelihood of sales growth is decreased by a multiplicative factor of 0.2691 when a business becomes medium-sized. For the model with SLSGRWPD2 as dependent variable, experiencing strong sales growth appears 0.2004 times less likely for medium-sized concerns. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 -- reinforcing the impression that transition from a small to a medium-sized enterprise genuinely influences the strength of past sales growth.

- Those reflecting the severity of growth constraints experienced by respondent enterprises. The sign of the coefficient for the variable GRWCONST in each model is negative, suggesting that the strength of past sales growth decreases with increasing severity of growth constraints faced. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

  Considering the model with SLSGRWPD1 as dependent variable, the odds ratio for severity of growth constraints suggests the likelihood of sales growth is decreased by a multiplicative factor of 0.7826 for each unit increase in the variable GRWCONST. For the model with SLSGRWPD2 as dependent variable, experiencing strong sales growth appears 0.8436 times less likely for each unit increase in the variable GRWCONST. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that the severity of growth constraints experienced has genuinely influenced the strength of past sales growth.

- Those reflecting the level of dependence amongst respondent enterprises upon external funding. The sign of the coefficient for the variable EXFINDEP in each model is positive, suggesting that the strength of past sales growth increases with increasing use of external finance. This is the direction of influence anticipated for this financial management characteristic on the basis of the background literature reviewed earlier.

  Considering the model with SLSGRWPD1 as dependent variable, the odds ratio for dependence on external funding suggests that the likelihood of sales growth is increased by a multiplicative factor of 1.1742 for each unit increase in the variable EXFINDEP. For the model with SLSGRWPD2 as dependent variable, experiencing strong sales growth appears 1.1967 times more likely for each unit increase in the variable EXFINDEP. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression

that use of external finance has genuinely influenced the strength of past sales growth.

- Those reflecting the profitability of respondent enterprises relative to that of their competitors. The sign of the coefficient for the variable PROFITD2 in each model is positive, suggesting that the strength of past sales growth increases with increasing profitability. This is the direction of influence anticipated for this performance measure on the basis of the background literature reviewed earlier.

  Considering the model with SLSGRWPD1 as dependent variable, the odds ratio for profitability relative to that of competitors suggests the likelihood of sales growth is increased by a multiplicative factor of 2.0916 if profitability is greater than that of competitors. For the model with SLSGRWPD2 as dependent variable, experiencing strong sales growth appears 2.5020 times more likely if profitability exceeds that of competitors. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that profitability relative to that of competitors has genuinely influenced the strength of past sales growth.

Some summary measures of goodness-of-fit for the logistic regression models in Table 7.10 are presented in the table below:

Table 7.11: Goodness-of-Fit for Past Sales Growth Models

Dependent Variable	Hosmer & Lemeshow Goodness-of-Fit Test	Cox & Snell R^2	Nagelkerke R^2
SLGRWPD1	χ^2=9.381), df=8, p=0.3112	0.076	0.108
SLGRWPD2	χ^2=19.063 1, df=8 p=0.0145	0.103	0.142

According to Hosmer & Lemeshow Goodness-of-Fit tests, the null hypothesis that the model being evaluated is a good fit with the data cannot be rejected for only the first model in the table above. While the goodness-of-fit of the second model is unacceptable, it can only be improved by the inclusion of at least one term in each of the models that is not statistically significant. It is also discouraging to observe that for both models the Cox & Snell and Nagelkerke R^2 measures appear less than satisfactory.

Some summary measures of classification success for the logistic regression models in Table 7.10 are presented in Table 7.12 on the next page. Optimistic as they are likely to be, the statistics presented in the table are somewhat discouraging. For one past sales growth outcome in each model, classification success appears to be substantially better than a 'constant only' model. However, for the other outcomes, the models actually perform worse than a 'constant only' model. Nevertheless, for both logistic regression models, the overall classification success noticeably exceeds an arbitrary cut-off of being 50 per cent correct.

Table 7.12: Classification Success for Past Sales Growth Models

Dependent Variable	Past Sales Growth Level	Observed Proportion (per cent)	Predicted Correctly (per cent)	Gain (percentage points)	Overall Predicted Correctly (per cent)
SLGRWPD1	No growth	29.90	12.34	-17.56	
	Growth	70.10	95.46	25.36	70.61
SLGRWPD2	No strong growth	64.76	88.41	23.65	
	Strong growth	35.24	30.32	-5.01	67.94

Before moving on, it is important to put what appear to be disappointing results of logistic regression modelling of past sales growth amongst respondent enterprises in an appropriate perspective. First, given the inherently multifactorial nature of business activity and the results of prior research in the area, it would, in fact, have been somewhat surprising to see the comprehensiveness of financial reporting practices appearing amongst the statistically significant independent variables in logistic regression models for past sales growth. Notice that the study variables FRCLIMAT and FINACCNT reflecting (*inter alia*) the extent of financial reporting to financiers are not amongst the statistically significant independent variables either. Recall that the principal research question in this study is symmetric in asking what impact, *if any*, financial reporting practices appear to have on achieved business growth and performance. It would seem, at this stage, that financial reporting practices exert a minor, although not entirely unimportant, influence on past sales growth – a now supportable finding not without value in terms of understanding the dynamics of growth in small and medium-sized enterprises.

A second point to bear in mind when appraising the modelling of past sales growth carried out is that, as particularly the prior research summarised in Chapter 2 of the thesis indicates, dependable means of 'picking winners' – that is, discovering SMEs with strong growth potential – have escaped researchers and policy makers in many countries up to this time. The models that have emerged in this research are, at least, no worse than those proffered in many other published and unpublished studies. Remember also that devising ways to pick winners amongst smaller manufacturing concerns in Australia is not included in the principal research question for this investigation, or in the key study objectives stemming from it. This does not mean, of course, that some light cannot or should not be shed on this important matter by the present research.

Consider now anticipated sales trends over the ensuing 12 months as revealed in the ordinal study variable SLSGROWF and the two dichotomous study variables SLSGRWFD1 and SLSGRWFD2. It is useful to first examine bivariate evidence of associations between these variables and the continuous study variable FRINDEX reflecting the comprehensiveness of financial reporting practices undertaken by

respondent enterprises. A Kruskal-Wallis one-way analysis of variance with SLSGROWF as the grouping variable indicates that the comprehensiveness of financial reporting practices is statistically greater in enterprises that anticipate growing more strongly in sales revenue terms (n=1,050, H=18.435, df=4, p=0.001). A Mann-Whitney test with SLSGRWFD1 as the grouping variable reveals a statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that anticipate growth in sales revenue terms and those which do not, with the former having more extensive financial reporting practices (n=1,050, U=81,940.000, p<0.000). Finally, a Mann-Whitney test with SLSGRWFD2 as the grouping variable suggests a statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that anticipate growing strongly in sales revenue terms and those which do not, with the former having more extensive financial reporting practices (n= 1,050, U=93,612.500, p=0.001). Altogether, these findings establish that the comprehensiveness of financial reporting practices has some potential as an explanatory factor for anticipated future sales growth of manufacturing concerns in the study sample.

Modelling of anticipated future sales growth amongst respondents to the *Best Financial Practice* survey, with the dichotomous study variables SLSGRWFD1 and SLSGRWFD2 as dependent variables, broadly followed the procedure set down in the previous sub-section of the chapter. However, the initial full model prior to undertaking backward stepwise elimination of independent variables contained, besides a constant, all 14 enterprise and financial management characteristics, the continuous study variable FRINDEX capturing the comprehensiveness of financial reporting practices, the dichotomous study variables PROFITD1 and PROFITD2 indicating profitability relative to that of competitors, and the dichotomous study variables SLSGRWPD1 and SLSGRWPD2 reflecting past sales growth. Specifications for the final models obtained are presented in Table 7.13 on the next page. The reduced number of cases used in modelling is due to missing values for some variables employed. Notice that all model parameters for both levels of the dependent past sales growth variable are statistically significant, and both models are statistically significant overall.

The first observation to make on the logistic regression models presented is that, despite the statistically significant bivariate associations noted earlier, anticipated future sales growth does not appear to depend in a multivariate setting on the comprehensiveness of financial reporting practices undertaken by respondent enterprises. This finding obviously calls for further comment later in the thesis. The second observation to make is that the logistic regression models suggest anticipated future sales growth is mainly influenced by four groupings of explanatory factors:

- Those reflecting apparent the extent of self-reliance or empowerment in business matters within respondent enterprises. The sign of the coefficient for the variable BUSINFLU in each model is positive, suggesting that the strength of anticipated

Table 7.13: Logistic Regression Models for Anticipated Sales Growth

Dependent Variable	Fitted Model (with n=998)	Odds Ratio	Odds Ratio Bounds[a]		Statistical Significance[b]	
			Lower	Upper	Parameter	Fitted Model
SLGRWFD1	0.9280				0.0000	
(No growth	+0.1980BUSINFLU	1.2189	1.0389	1.4302	0.0152	
vs Growth)	+0.8933DEVELPOR	2.4433	1.9985	2.9871	0.0000	
	-1.8635SME	0.1551	0.0748	0.3217	0.0000	
	+1.5155SLGRWPD2	4.5515	2.9895	6.9296	0.0009	0.0000
SLGRWFD2	-1.8981				0.0000	
(No strong	+0.2240BUSINFLU	1.2511	1.0593	1.4776	0.0083	
growth vs	+0.6591DEVELPOR	1.9330	1.5636	2.3896	0.0000	
Strong	-1.0668SME	0.3441	0.1651	0.7171	0.0044	
growth)	+2.4897SLGRWPD2	12.0582	8.6550	16.7994	0.0000	0.0000

[a] Bounds are 95 per cent confidence limits.
[b] Probability for the appropriate significance test. For individual parameters this is a Wald test. For the fitted model this is a Likelihood Ratio test comparing the 'constant only' model with the fitted model.

future sales growth increases with increasing self-reliance. This is the direction of influence expected for this enterprise characteristic on the basis of the background literature reviewed earlier.

Considering the model with SLSGRWFD1 as dependent variable, the odds ratio for self-reliance suggests the likelihood of anticipated sales growth is increased by a multiplicative factor of 1.2189 for each unit increase in the variable BUSINFLU. For the model with SLSGRWFD2 as dependent variable, anticipation of strong future sales growth appears 1.2551 times more likely for each unit increase in the variable BUSINFLU. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 -- reinforcing the impression that extent of self-reliance genuinely influences the strength of anticipated sales growth.

- Those reflecting development orientation such as how forward looking enterprise management is, what degree of commitment there is to growth, including through exporting, and enterprise size. The sign of the coefficient for the variable DEVELPOR in each model is positive, suggesting that the strength of anticipated future sales growth increases with increasing development orientation. This is the direction of influence expected for this enterprise characteristic on the basis of the background literature reviewed earlier.

  Considering the model with SLSGRWFD1 as dependent variable, the odds ratio for development orientation suggests the likelihood of anticipated sales growth is increased by a multiplicative factor of 2.4433 for each unit increase in the variable DEVELPOR. For the model with SLSGRWFD2 as dependent variable,

anticipation of strong future sales growth appears 1.9330 times more likely for each unit increase in the variable DEVELPOR. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that development orientation genuinely influences the strength of anticipated sales growth.

- Those reflecting enterprise size in employment terms, beyond their indirect influence through the study variable DEVELPOR just considered. As with modelling past sales growth, the ordinal study variable EMPLOYS was initially entered into logistic regression models for anticipated future sales growth as a categorical independent variable. Again, of the four design variables produced by the SPSS statistical software for this independent variable, only that distinguishing small enterprises from medium-sized enterprises proved to be statistically significant in models developed. Accordingly, EMPLOYS was replaced with the dichotomous study variable SME indicating whether respondent enterprises are small or medium-sized in employment terms.

  The sign of the coefficient for the variable SME in each model is negative, suggesting that the strength of anticipated future sales growth decreases when manufacturing concerns become medium-sized. Any or all of the explanations given for the corresponding phenomenon in relation to past sales growth may apply. Considering the model with SLSGRWFD1 as dependent variable, the odds ratio for SME suggests the likelihood of anticipated sales growth is decreased by a multiplicative factor of 0 1551 when a business becomes medium-sized. For the model with SLSGRWFD2 as dependent variable, anticipation of strong future sales growth appears 0.3441 times less likely for medium-sized concerns. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that transition from a small to a medium-sized enterprise genuinely influences the strength of anticipated sales growth.
- Those reflecting immediate past sales growth experience amongst respondent enterprises. The sign of the coefficient for the variable SLGRWPD2 in each model is positive, suggesting that the strength of anticipated future sales growth increases with increasing strength of past sales growth. This is clearly the direction of influence one would expect.

  Considering the model with SLSGRWFD1 as dependent variable, the odds ratio for past sales growth suggests the likelihood of anticipated sales growth is increased by a multiplicative factor of 4.5515 if sales growth has already occurred in the immediate past. For the model with SLSGRWFD2 as dependent variable, anticipation of strong future sales growth appears 12.0582 times more likely if the concern has just experienced strong sales growth. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the

impression that past sales growth experience genuinely influences the strength of anticipated sales growth.

Of the variable groupings identified, experience of strong past sales growth seems to be, by far, the greatest influence upon anticipated sales growth amongst respondent enterprises. However, more parsimonious models including just this explanatory factor proved to be noticeably inferior to the models presented in Table 7.13.

Some summary measures of goodness-of-fit for the logistic regression models in Table 7.13 are presented in the table below:

Table 7.14: Goodness-of-Fit for Anticipated Sales Growth Models

Dependent Variable	Hosmer & Lemeshow Goodness-of-Fit Test	Cox & Snell R^2	Nagelkerke R^2
SLGRWFD1	χ^2=2.5281, df=8, p=0.9604	0.175	0.256
SLGRWFD2	χ^2=14.4364, df=8, p=0.0711	0.299	0.421

According to Hosmer & Lemeshow Goodness-of-Fit tests, the null hypothesis that the model being evaluated is a good fit with the data cannot be rejected for either model in the table above. Furthermore, it is encouraging to observe that for both models the Cox & Snell and Nagelkerke R^2 measures generally appear satisfactory.

Some summary measures of classification success for the logistic regression models in Table 7.13 are presented in the table below:

Table 7.15: Classification Success for Anticipated Sales Growth Models

Dependent Variable	Anticipated Sales Growth Level	Observed Proportion (per cent)	Predicted Correctly (per cent)	Gain (percentage points)	Overall Predicted Correctly (per cent)
SLGRWFD1	No growth	26.55	34.34	7.79	
	Growth	73.45	92.77	19.32	77.25
SLGRWFD2	No strong growth	68.74	86.01	17.27	
	Strong growth	31.26	66.99	35.73	80.06

Even though the statistics presented in the table are likely to be optimistic reflections of the reliability of the models chosen, they might nevertheless be described as very encouraging. For most anticipated sales growth outcomes in the models, classification success appears to be substantially better than a 'constant only' model. Furthermore, for both logistic regression models, the overall classification success noticeably exceeds an arbitrary cut-off of being 50 per cent correct.

In closing this sub-section of the chapter, the observation should be made that the principal reason why the logistic regression models for anticipated sales growth appear to fit and perform so much better than those for past sales growth is that the former

have the advantage of being able to include immediate past experience of sales growth amongst the independent variables used. As has already been pointed out, experience of strong past sales growth seems to be, by far, the greatest influence upon anticipated sales growth amongst respondent enterprises. In other words, a useful guide when framing expectations of future sales growth seems to be whatever sales growth has recently been achieved by the business – a not unexpected finding. Apart from these comments, those made earlier regarding an appropriate light in which to view the findings of logistic regression modelling of past sales growth also apply in relation to modelling of anticipated future sales growth in the study sample.

7.3.3 Business Performance

The broad intention in this sub-section of the chapter is to reveal through logistic regression modelling which of the independent variables representing financial reporting practices and business context characteristics seem most influential on achieved business performance amongst manufacturing SMEs in the study sample. Logistic regression is undertaken separately for three dependent variables representing business performance outcomes, briefly described as follows:

- Current annual sales turnover of respondent enterprises – ordinal study variable SALES initially with six levels reflecting business performance in terms of sales revenues. This variable has been converted into two dichotomised study variables SALESD1 and SALESD2. The first of these new variables indicates whether or not current annual sales exceed $5 million. The second new variable indicates whether or not current annual sales exceed $10 million.
- Profitability of respondent enterprises relative to that of their competitors – ordinal study variable PROFITAB initially with three levels reflecting business performance in terms of profitability. Notice that this study variable has been modified by focusing on only those respondents able to indicate their profitability relative to that of competitors. This allows the variable to be appropriately treated as ordinal in measurement level, rather than nominal as it was presented in Chapter 6. The variable has subsequently been converted into two dichotomised study variables PROFITD1 and PROFITD2. The first of these new variables indicates whether or not profitability is lower than that of competitors. The second new variable indicates whether or not profitability is greater than that of competitors.
- Recency of an unexpected liquidity crisis for respondent enterprises – ordinal study variable LIQCRIS initially with three levels reflecting business performance in terms of liquidity. This variable has been converted into two dichotomised study variables LIQCRSD1 and LIQCRSD2. The first of these new variables indicates whether or not an unexpected liquidity crisis has taken place in the last year. The

second new variable indicates whether or not an unexpected liquidity crisis has occurred in the last two years.

In part, the variable conversions described have been undertaken to deal with low numbers of responses for some initial categories of the dependent variables. The variable conversions also facilitate appropriate logistic regression methodologies to be applied to the ordinal or nominal dependent variables.

Before proceeding, it is useful to examine associations between the business performance variables described above. Because of its size, a correlation matrix for all business performance measures used as dependent variables during predictive modelling in this research is presented in Appendix C to the thesis (see *C8 Associations Amongst Business Growth and Performance Variables*). While 13 of the 28 substantive correlations are statistically significant, they are all very weak except those between linked variables reflecting different levels of the same performance measure, and those between some liquidity and profitability variables. Less recent experience of an unexpected liquidity crisis as reflected in ordinal study variable LIQCRIS is associated in a statistically significant manner with greater profitability as revealed by ordinal study variable PROFITAB (n=681, Kendall's tau b=0.229, p<0.000). Altogether, this evidence suggests that recency of an unexpected liquidity crisis should be considered as an independent variable in logistic regression modelling of profitability. Similarly, profitability relative to that of competitors should be considered as an independent variable in logistic regression modelling of liquidity crisis experience. Based on earlier discussion, past sales growth should be considered as an independent variable in logistic regression modelling of profitability

As a final preliminary before logistic regression modelling of current annual sales turnover, it is useful to examine bivariate evidence of associations between this outcome and the continuous study variable FRINDEX reflecting the comprehensiveness of financial reporting practices undertaken by respondent enterprises. A Kruskal-Wallis one-way analysis of variance with SALES as the grouping variable indicates that the comprehensiveness of financial reporting practices is statistically greater in enterprises that have higher annual sales revenues (n=1,050, H=141.893, df=5, p<0.000). A Mann-Whitney test with SALESD1 as the grouping variable suggests a statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that have annual sales revenues exceeding $5 million and those which have not, with the former having more extensive financial reporting practices (n=1,050, U=75,116.500, p<0.000). Finally, a Mann-Whitney test with SALESD2 as the grouping variable indicates a statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that have annual sales revenues exceeding $10 million and those which have not, with the former having more extensive financial reporting practices (n=1,050, U=40,688.000, p<0.000). Altogether, these findings establish that the comprehensiveness of financial reporting practices has

some potential as an explanatory factor for current annual sales turnover achieved by manufacturing concerns in the study sample.

Modelling of current annual sales turnover amongst respondents to the *Best Financial Practice* survey, with the dichotomous study variables SALESD1 and SALESD2 as dependent variables, broadly followed the procedure set down in a previous sub-section of the chapter. However, the initial full model prior to undertaking backward stepwise elimination of independent variables contained, besides a constant, all 14 enterprise and financial management characteristics and the continuous study variable FRINDEX capturing the comprehensiveness of financial reporting practices. Specifications for the final model obtained are presented in the table below:

Table 7.16: Logistic Regression Models for Annual Sales Turnover

Dependent Variable	Fitted Model (with n=1,050)	Odds Ratio	Odds Ratio Bounds[a]		Statistical Significance[b]	
			Lower	Upper	Parameter	Fitted Model
SALESD1	-3.1663				0.0000	
(Less than	+0.5258DEVELPOR	1.6918	1.3594	2.1054	0.0000	
$5 million vs	+2.6096EMPLOY2	13.5940	7.8647	23.4970	0.0000	
More than	+2.4543EMPLOY3	11.6382	6.8336	19.8209	0.0000	
$5 million)	-0.2729EXADVICE	0.7612	0.6531	0.8771	0.0005	0.0000
SALESD2	-5.3337				0.0000	
(Less than	+0.8737DEVELPOR	2.3959	1.8267	3.1424	0.0000	
$10 million vs	+2.6276EMPLOY2	13.8399	3.2599	58.7580	0.0004	
More than	+2.3663EMPLOY3	10.6583	6.4634	17.5758	0.0000	
$10 million)	-0.2237EXADVICE	0.7996	0.6587	0.9707	0.0238	0.0000

[a] Bounds are 95 per cent confidence limits.
[b] Probability for the appropriate significance test. For individual parameters this is a Wald test. For the fitted model this is a Likelihood Ratio test comparing the 'constant only' model with the fitted model.

Notice that all model parameters for both levels of the dependent annual sales turnover variable are statistically significant, and both models are statistically significant overall.

The first observation to make on the logistic regression models presented is that, despite the statistically significant bivariate associations noted earlier, current annual sales turnover does not appear to depend in a multivariate setting on the comprehensiveness of financial reporting practices undertaken by respondent enterprises. This finding obviously calls for further comment later in the thesis. The second observation to make is that the logistic regression models suggest current annual sales turnover is mainly influenced by three groupings of explanatory factors:

- Those reflecting development orientation such as how forward looking enterprise management is, what degree of commitment there is to growth, including through exporting, and enterprise size. The sign of the coefficient for the variable DEVELPOR in each model is positive, suggesting that current annual sales

turnover increases with increasing development orientation. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

Considering the model with SALESD1 as dependent variable, the odds ratio for development orientation suggests the likelihood of current annual sales turnover exceeding $5 million is increased by a multiplicative factor of 1.6918 for each unit increase in the variable DEVELPOR. For the model with SALESD2 as dependent variable, annual sales turnover exceeding $10 million appears 2.3959 times more likely for each unit increase in the variable DEVELPOR. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that development orientation genuinely influences the current level of annual sales turnover.

- Those reflecting enterprise size in employment terms, beyond their indirect influence through the study variable DEVELPOR just considered. As with modelling sales growth, the ordinal study variable EMPLOYS was initially entered into logistic regression models for annual sales turnover as a categorical independent variable. Of the four design variables produced by the SPSS statistical software for this independent variable, only two – distinguishing small enterprises with fewer than 20 employees from those with more than 20, and distinguishing small enterprises with fewer than 50 employees from those with more than 50 – proved to be statistically significant in models developed. Accordingly, EMPLOYS was replaced with two dichotomous study variables EMPLOY2 and EMPLOY3 indicating, respectively, whether respondent enterprises have fewer or more than 20 employees and have fewer or more than 50 employees.

  The sign of the coefficient for the variable EMPLOY2 in each model is positive, suggesting that the level of current annual sales turnover increases with increasing size in employment terms. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier. Considering the model with SALESD1 as dependent variable, the odds ratio for EMPLOY2 suggests the likelihood of current annual sales turnover exceeding $5 million is increased by a multiplicative factor of 13.5940 when a business exceeds 20 employees. For the model with SALESD2 as dependent variable, annual sales turnover exceeding $10 million appears 13.8399 times more likely for concerns with more than 20 employees. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that employment growth genuinely influences the current level of annual sales turnover.

The sign of the coefficient for the variable EMPLOY3 in each model is positive, suggesting that the level of current annual sales turnover increases with increasing size in employment terms. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier. Considering the model with SALESD1 as dependent variable, the odds ratio for EMPLOY3 suggests the likelihood of current annual sales turnover exceeding $5 million is increased by a multiplicative factor of 11.6382 when a business exceeds 50 employees. For the model with SALESD2 as dependent variable, annual sales turnover exceeding $10 million appears 10.6583 times more likely for concerns with more than 50 employees. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that employment growth genuinely influences the current level of annual sales turnover.

- Those reflecting the degree of dependence amongst respondent enterprises upon outside professionals, usually public accountants, for advice on a range of financial matters. The sign of the coefficient for the variable EXADVICE in each model is negative, suggesting that current annual sales turnover is lower for those manufacturing concerns with increasing dependence on external financial advisers. Remembering that smaller enterprises frequently cannot afford to employ their own internal finance staff and therefore tend to be more dependent on outside financial advice, this is the direction of influence anticipated for this financial management characteristic on the basis of the background literature reviewed earlier.

  Considering the model with SALESD1 as dependent variable, the odds ratio for the degree of dependence upon external financial advice suggests the likelihood of current annual sales turnover exceeding $5 million is decreased by a multiplicative factor of 0.7612 for each unit increase in the variable EXADVICE. For the model with FRGRPT2 as dependent variable, having current annual sales turnover exceeding $10 million appears 0.7996 times less likely for each unit increase in the variable EXADVICE. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that degree of dependence upon external financial advice is genuinely associated with the current level of annual sales turnover.

Of the variable groupings identified, enterprise size in employment terms seems to be, by far, the greatest influence upon current annual sales turnover amongst respondent enterprises. However, more parsimonious models including just this explanatory factor proved to be noticeably inferior to the models presented in Table 7.16.

Some summary measures of goodness-of-fit for the logistic regression models in Table 7.16 are presented in Table 7.17 on the next page. According to Hosmer & Lemeshow Goodness-of-Fit tests, the null hypothesis that the model being evaluated is

Table 7.17: Goodness-of-Fit for Annual Sales Turnover Models

Dependent Variable	Hosmer & Lemeshow Goodness-of-Fit Test	Cox & Snell R^2	Nagelkerke R^2
SALESD1	χ^2=5.1662 df=8, p=0.7397	0.438	0.609
SALESD2	χ^2=1.5458 df=8, p=0.9919	0.344	0.597

a good fit with the data cannot be rejected for either model in the table above. Furthermore, it is encouraging to observe that for both models the Cox & Snell and Nagelkerke R^2 measures appear particularly satisfactory.

Some summary measures of classification success for the logistic regression models in Table 7.16 are presented in the table below:

Table 7.18: Classification Success for Annual Sales Turnover Models

Dependent Variable	Anticipated Sales Turnover Level	Observed Proportion (per cent)	Predicted Correctly (per cent)	Gain (percentage points)	Overall Predicted Correctly (per cent)
SALESD1	Less than $5 million	66.76	93.44	26.68	
	More than $5 million	33.24	62.75	29.51	83.24
SALESD2	Less than $10 million	84.67	94.60	9.93	
	More than $10 million	15.33	67.70	52.37	90.48

Even though the statistics presented in the table are likely to be optimistic reflections of the reliability of the models chosen, they might nevertheless be described as very encouraging. For both annual sales turnover outcomes in both models, classification success appears to be substantially better than a 'constant only' model. For both logistic regression models, the overall classification success noticeably exceeds an arbitrary cut-off of being 50 per cent correct. The strong, statistically significant association between annual sales turnover and enterprise size in employment terms, noted in Chapter 6 of the thesis, has clearly influenced the goodness-of-fit and classification success of these models. Apart from these comments, those made earlier regarding an appropriate light in which to view the findings of logistic regression modelling of past sales growth also apply in relation to modelling of current annual sales turnover in the study sample.

Consider now the profitability of respondent enterprises relative to that of their competitors as revealed in the ordinal study variable PROFITAB and the two dichotomised study variables PROFITD1 and PROFITD2. It is useful to first examine bivariate evidence of associations between these variables and the continuous study variable FRINDEX reflecting the comprehensiveness of financial reporting practices undertaken by respondent enterprises. A Kruskal-Wallis one-way analysis of variance

with PROFITAB as the grouping variable reveals that the comprehensiveness of financial reporting practices is statistically unrelated to profitability relative to that of competitors (n=786, H=0.548, df=2, p=0.760). A Mann-Whitney test with PROFITD1 as the grouping variable suggests no statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that are less profitable than competitors and those which are not (n=786, U=40,883.000, p=0.601). Finally, a Mann-Whitney test with PROFITD2 as the grouping variable indicates no statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that are more profitable than competitors and those which are not (n=786, U=61,245.000, p=0.516). Altogether, these findings establish that the comprehensiveness of financial reporting practices has little potential as an explanatory factor for the profitability of respondent enterprises relative to that of their competitors.

Modelling of profitability relative to that of competitors amongst respondents to the *Best Financial Practice* survey, with the dichotomous study variables PROFITD1 and PROFITD2 as dependent variables, broadly followed the procedure set down in a previous sub-section of the chapter. However, the initial full model prior to undertaking backward stepwise elimination of independent variables contained, besides a constant, all 14 enterprise and financial management characteristics, the continuous study variable FRINDEX capturing the comprehensiveness of financial reporting practices, the dichotomous study variables LIQCRSD1 and LIQCRSD2 reflecting the recency of an unexpected liquidity crisis, and the dichotomous study variables SLSGRWPD1 and SLSGRWPD2 reflecting past sales growth. Specifications for the final model obtained are presented in the table below:

Table 7.19: Logistic Regression Models for Profitability

Dependent Variable	Fitted Model (with n=681)	Odds Ratio	Odds Ratio Bounds[a]		Statistical Significance[b]	
			Lower	Upper	Parameter	Fitted Model
PROFITD1	0.9811				0.0000	
(Lower vs	-0.3448GRWCONST	0.7084	0.5665	0.8858	0.0025	
Equal +	+0.9924LIQCRSD2	2.6977	1.7367	4.1903	0.0000	
Higher)	+0.5834SLGRWPD2	1.7922	1.1214	2.8642	0.0147	0.0000
PROFITD2	-1.8609				0.0000	
(Lower +	-0.3598GRWCONST	0.6978	0.5800	0.8396	0.0001	
Equal vs	+0.7507LIQCRSD2	2.1184	1.4519	3.0910	0.0001	
Higher)	+1.0581SLGRWPD2	2.8808	2.0124	4.1241	0.0000	0.0000

[a] Bounds are 95 per cent confidence limits.
[b] Probability for the appropriate significance test. For individual parameters this is a Wald test. For the fitted model this is a Likelihood Ratio test comparing the 'constant only' model with the fitted model.

The reduced number of cases used in modelling is due to missing values for some variables employed. Notice that all model parameters for both levels of the dependent past sales growth variable are statistically significant, and both models are statistically significant overall.

The first observation to make on the logistic regression models presented is that, in agreement with the statistically insignificant bivariate associations noted earlier, profitability relative to that of competitors does not appear to depend in a multivariate setting on the comprehensiveness of financial reporting practices undertaken by respondent enterprises. This finding will receive further comment later in the thesis. The second observation to make is that the logistic regression models suggest profitability relative to that of competitors is mainly influenced by three groupings of explanatory factors:

- Those reflecting the severity of growth constraints experienced by respondent enterprises. The sign of the coefficient for the variable GRWCONST in each model is negative, suggesting profitability relative to that of competitors decreases with increasing severity of growth constraints faced. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

  Considering the model with PROFITD1 as dependent variable, the odds ratio for severity of growth constraints suggests the likelihood of profitability at least matching that of competitors is decreased by a multiplicative factor of 0.7084 for each unit increase in the variable GRWCONST. For the model with PROFITD2 as dependent variable, having profitability greater than that of competitors appears 0.6978 times less likely for each unit increase in the variable GRWCONST. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that the severity of growth constraints experienced has genuinely influenced profitability relative to that of competitors.
- Those reflecting recency of an unexpected liquidity crisis amongst respondent enterprises. The sign of the coefficient for the variable LIQCRSD2 in each model is positive, suggesting profitability relative to that of competitors increases with increasing time since the last unexpected liquidity crisis. This is clearly the direction of influence one would expect.

  Considering the model with PROFITD1 as dependent variable, the odds ratio for recency of an unexpected liquidity crisis suggests the likelihood of profitability at least matching that of competitors is increased by a multiplicative factor of 2.6977 if the last unexpected liquidity crisis occurred more than two years ago. For the model with PROFITD2 as dependent variable, having profitability greater than that of competitors appears 2.1184 times more likely if the last unexpected liquidity crisis occurred more than two years ago. Notice that the 95 per cent

confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that recency of an unexpected liquidity crisis genuinely influences profitability relative to that of competitors.

- Those reflecting immediate past sales growth experience amongst respondent enterprises. The sign of the coefficient for the variable SLGRWPD2 in each model is positive, suggesting profitability relative to that of competitors increases with increasing strength of past sales growth. This is a direction of influence one could expect.

Considering the model with PROFITD1 as dependent variable, the odds ratio for past sales growth suggests the likelihood of profitability at least matching that of competitors is increased by a multiplicative factor of 1.7922 if sales growth has occurred in the immediate past. For the model with PROFITD2 as dependent variable, having profitability greater than that of competitors appears 2.8808 times more likely if the concern has just experienced strong sales growth. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that past sales growth experience genuinely influences the profitability relative to that of competitors.

Some summary measures of goodness-of-fit for the logistic regression models in Table 7.19 are presented in the table below:

Table 7.20: Goodness-of-Fit for Profitability Models

Dependent Variable	Hosmer & Lemeshow Goodness-of-Fit Test	Cox & Snell R^2	Nagelkerke R^2
PROFITD1	χ^2=10.862 4, df=8, p=0.2906	0.069	0.115
PROFITD2	χ^2=8.907 , df=8, p=0.3501	0.108	0.156

According to Hosmer & Lemeshow Goodness-of-Fit tests, the null hypothesis that the model being evaluated is a good fit with the data cannot be rejected for either model in the table above. However, for both models the Cox & Snell and Nagelkerke R^2 measures appear less than satisfactory.

Some summary measures of classification success for the logistic regression models in Table 7.19 are presented in Table 7.21 on the next page. Optimistic as they are likely to be, the statistics presented in the table are somewhat discouraging. For one profitability level in each model, classification success appears to be substantially better than a 'constant only' model. However, for the other outcomes, the models actually perform worse than a 'constant only' model. Nevertheless, for both logistic regression models, the overall classification success noticeably exceeds an arbitrary cut-off of being 50 per cent correct. Apart from these comments, those made earlier regarding an appropriate light in which to view the findings of logistic regression modelling of past

Table 7.21: Classification Success for Profitability Models

Dependent Variable	Profitability Level Compared to Competitors	Observed Proportion (per cent)	Predicted Correctly (per cent)	Gain (percentage points)	Overall Predicted Correctly (per cent)
PROFITD1	Lower Equal + Higher	17.62 82.38	0.00 99.82	-17.62 17.44	82.23
PROFITD2	Lower + Equal Higher	72.25 27.75	93.50 22.75	21.25 -5.00	73.86

sales growth also apply in relation to modelling of profitability relative to that of competitors in the study sample.

Consider now the recency of an unexpected liquidity crisis for respondent enterprises as revealed in the ordinal study variable LIQCRIS and the two dichotomous study variables LIQCRSD1 and LIQCRSD2. It is useful to first examine bivariate evidence of associations between these variables and the continuous study variable FRINDEX reflecting the comprehensiveness of financial reporting practices undertaken by respondent enterprises. A Kruskal-Wallis one-way analysis of variance with LIQCRIS as the grouping variable reveals that the comprehensiveness of financial reporting practices is statistically related in a complex manner to the recency of an unexpected liquidity crisis (n=918, H=8.988, df=2, p=0.011). However, a Mann-Whitney test with LIQCRSD1 as the grouping variable suggests no statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that have experienced an unexpected liquidity crisis in the last year and those which have not (n=918, U=89,590.500, p=0.181). Furthermore, a Mann-Whitney test with LIQCRSD2 as the grouping variable indicates no statistically significant difference in the comprehensiveness of financial reporting practices between respondent enterprises that have experienced an unexpected liquidity crisis in the last two years and those which have not (n=918, U=102,102.000, p=0.466). Altogether, these findings establish that the comprehensiveness of financial reporting practices has only limited potential as an explanatory factor for the recency of an unexpected liquidity crisis amongst manufacturing concerns in the study sample.

Modelling of unexpected liquidity crisis experience amongst respondents to the *Best Financial Practice* survey, with the dichotomous study variables LIQCRSD1 and LIQCRSD2 as dependent variables, broadly followed the procedure set down in a previous sub-section of the chapter. However, the initial full model prior to undertaking backward stepwise elimination of independent variables contained, besides a constant, all 14 enterprise and financial management characteristics, the continuous study variable FRINDEX capturing the comprehensiveness of financial reporting practices, and the dichotomous study variables PROFITD1 and PROFITD2 indicating profitability

relative to that of competitors. Specifications for the final model obtained are presented in the table below:

Table 7.22: Logistic Regression Models for Liquidity Crisis Experience

Dependent Variable	Fitted Model (with n=681)	Odds Ratio	Odds Ratio Bounds[a]		Statistical Significance[b]	
			Lower	Upper	Parameter	Fitted Model
LIQCRSD1	0.5828				0.0000	
(Last year vs	-0.4999GRWCONST	0.6066	0.5038	0.7303	0.0000	
Not last	-0.3075EXFINDEP	0.7353	0.6323	0.8552	0.0001	
year)	+0.5553PROFITD2	1.7425	1.1565	2.6254	0.0079	0.0000
LIQCRSD2						
(Last 2 years	-0.4612GRWCONST	0.6305	0.5302	0.7499	0.0000	
vs Not last	-0.2966EXFINDEP	0.7433	0.6477	0.8530	0.0000	
2 years)	+0.6640PROFITD2	1.9426	1.4049	2.6861	0.0001	0.0000

[a] Bounds are 95 per cent confidence limits.
[b] Probability for the appropriate significance test. For individual parameters this is a Wald test. For the fitted model this is a Likelihood Ratio test comparing the 'constant only' model with the fitted model.

The reduced number of cases used in modelling is due to missing values for some variables employed. Notice that all model parameters for both levels of the dependent past sales growth variable are statistically significant, and both models are statistically significant overall.

The first observation to make on the logistic regression models presented is that, in agreement with the mostly statistically insignificant bivariate associations noted earlier, recency of an unexpected liquidity crisis does not appear to depend in a multivariate setting on the comprehensiveness of financial reporting practices undertaken by respondent enterprises. This finding will receive further comment later in the thesis. The second observation to make is that the logistic regression models suggest that recency of an unexpected liquidity crisis is mainly influenced by three groupings of explanatory factors:

- Those reflecting the severity of growth constraints experienced by respondent enterprises. The sign of the coefficient for the variable GRWCONST in each model is negative, suggesting an unexpected liquidity crisis becomes a more recent occurrence with increasing severity of growth constraints faced. This is the direction of influence anticipated for this enterprise characteristic on the basis of the background literature reviewed earlier.

  Considering the model with LIQCRSD1 as dependent variable, the odds ratio for severity of growth constraints suggests that the likelihood of not having experienced an unexpected liquidity crisis in the last year is decreased by a multiplicative factor of 0.6066 for each unit increase in the variable GRWCONST.

For the model with LIQCFSD2 as dependent variable, not having experienced an unexpected liquidity crisis in the last two years appears 0.6305 times less likely for each unit increase in the variable GRWCONST. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 -- reinforcing the impression that the severity of growth constraints experienced has genuinely influenced the recency of an unexpected liquidity crisis.

- Those reflecting the level of dependence amongst respondent enterprises upon external funding. The sign of the coefficient for the variable EXFINDEP in each model is negative, suggesting an unexpected liquidity crisis becomes a more recent occurrence with increasing use of external finance. This is the direction of influence anticipated for this financial management characteristic on the basis of the background literature reviewed earlier.

  Considering the model with LIQCRSD1 as dependent variable, the odds ratio for dependence on external funding suggests that the likelihood of not having experienced an unexpected liquidity crisis in the last year is decreased by a multiplicative factor of 0.7353 for each unit increase in the variable EXFINDEP. For the model with LIQCRSD2 as dependent variable, not having experienced an unexpected liquidity crisis in the last two years appears 0.7433 times less likely for each unit increase in the variable EXFINDEP. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 -- reinforcing the impression that use of external finance has genuinely influenced the recency of an unexpected liquidity crisis.

- Those reflecting the profitability of respondent enterprises relative to that of their competitors. The sign of the coefficient for the variable PROFITD2 in each model is positive, suggesting that an unexpected liquidity crisis becomes a less recent occurrence with increasing profitability. This is clearly the direction of influence one would expect.

  Considering the model with LIQCRSD1 as dependent variable, the odds ratio for profitability relative to that of competitors suggests that the likelihood of not having experienced an unexpected liquidity crisis in the last year is increased by a multiplicative factor of 1.7425 if profitability is greater than that of competitors. For the model with LIQCRSD2 as dependent variable, not having experienced an unexpected liquidity crisis in the last two years appears 1.9426 times more likely if profitability exceeds that of competitors. Notice that the 95 per cent confidence intervals for these odds ratios do not include 1.0000 – reinforcing the impression that profitability relative to that of competitors has genuinely influenced the recency of an unexpected liquidity crisis.

Some summary measures of goodness-of-fit for the logistic regression models in Table 7.22 are presented in Table 7.23 on the next page. According to Hosmer &

Table 7.23: Goodness-of-Fit for Liquidity Crisis Models

Dependent Variable	Hosmer & Lemeshow Goodness-of-Fit Test	Cox & Snell R^2	Nagelkerke R^2
LIQCRSD1	χ^2=16.2935, df=8, p=0.0384	0.104	0.144
LIQCRSD2	χ^2=14.4274, df=8, p=0.0713	0.121	0.161

Lemeshow Goodness-of-Fit tests, the null hypothesis that the model being evaluated is a good fit with the data cannot be rejected for only the second model in the table above. While the goodness-of-fit of the first model is unacceptable, it can only be improved by the inclusion of at least one term in each of the models that is not statistically significant. It is also discouraging to observe that for both models the Cox & Snell and Nagelkerke R^2 measures appear less than satisfactory.

Some summary measures of classification success for the logistic regression models in Table 7.22 are presented in the table below:

Table 7.24: Classification Success for Liquidity Crisis Models

Dependent Variable	Recency of Unexpected Liquidity Crisis	Observed Proportion (per cent)	Predicted Correctly (per cent)	Gain (percentage points)	Overall Predicted Correctly (per cent)
LIQCRSD1	Last year	34.21	30.47	-3.74	
	Not last year	65.79	89.73	23.94	69.73
LIQCRSD2	Last two years	46.55	62.46	15.91	
	Not last two years	53.45	67.58	14.13	65.20

Even though the statistics presented in the table are likely to be optimistic reflections of the reliability of the models chosen, they might nevertheless be described as somewhat encouraging. For most liquidity crisis outcomes in the models, classification success appears to be substantially better than a 'constant only' model. For both logistic regression models, the overall classification success noticeably exceeds an arbitrary cut-off of being 50 per cent correct. Apart from these comments, those made earlier regarding an appropriate light in which to view the findings of logistic regression modelling of past sales growth also apply in relation to modelling of recency of an unexpected liquidity crisis in the study sample.

7.3.4 Multivariate Predictive Modelling Summary

Logistic regression modelling has been extremely useful in addressing the first part of the principal research question for this study: discovering which enterprise and financial management characteristics seem to most influence financial reporting practices adopted in small and medium-sized manufacturing enterprises legally organised as

proprietary companies in Australia. The logistic regression models developed for financial reporting practices have the following form:

$$\ln[\pi/(1-\pi)] = 0.9345 + 0.6237\text{DEVELPOR} - 0.1688\text{OWNERMNG} - 0.3588\text{TECHNOLG} - 0.2214\text{EXADVICE} + 0.4938\text{FRCLIMAT}$$

Eqn 7.3

where π = probability that financial reporting practices are at an intermediate or high level

and:

$$\ln[\pi/(1-\pi)] = -0.7967 + 0.6035\text{DEVELPOR} - 0.2061\text{OWNERMNG} - 0.2048\text{TECHNOLG} - 0.2718\text{EXADVICE} + 0.6721\text{FRCLIMAT}$$

Eqn 7.4

where π = probability that financial reporting practices are at a high level

The explanatory factors for the comprehensiveness of financial reporting practices that have emerged in the models generally make business sense and sit well with prior scholarly knowledge in the area. Furthermore, the goodness-of-fit and classification success of the models are encouraging.

Logistic regression has also been helpful in addressing the second part of the principal research question for this study: discovering what impact, if any, financial reporting practices appear to have on achieved business growth and performance in small and medium-sized manufacturing enterprises legally organised as proprietary companies in Australia. The logistic regression models developed for past sales growth have the following form:

$$\ln[\pi/(1-\pi)] = 0.8006 + 0.5839\text{DEVELPOR} - 1.3127\text{SME} - 0.2451\text{GRWCONST} + 0.1606\text{EXFINDEP} + 0.7379\text{PROFITD2}$$

Eqn 7.5

where π = probability that sales growth has recently occurred

and:

$$\ln[\pi/(1-\pi)] = -0.8372 + 0.6300\text{DEVELPOR} - 1.6074\text{SME} - 0.1700\text{GRWCONST} + 0.1796\text{EXFINDEP} + 0.9171\text{PROFITD2}$$

Eqn 7.6

where π = probability that strong sales growth has recently occurred

And the logistic regression models developed for anticipated future sales growth have the following form:

$$\ln[\pi/(1-\pi)] = 0.9280 + 0.1980\text{BUSINFLU} + 0.8933\text{DEVELPOR} - 1.8635\text{SME} + 1.5155\text{SLGRWPD2}$$

Eqn 7.7

where π = probability that sales growth is anticipated in the near future

and:

$$\ln[\pi/(1-\pi)] = -1.8981 + 0.2240\text{BUSINFLU} + 0.6591\text{DEVELPOR} - 1.0668\text{SME} + 2.4897\text{SLGRWPD2}$$

Eqn 7.8

where π = probability that strong sales growth is anticipated in the near future

The explanatory factors for past and anticipated future sales growth that have emerged in the models seem to make business sense and are not inconsistent with prior scholarly knowledge in the area. Most importantly though, the comprehensiveness of financial reporting practices does not feature as an independent variable in any of the sales growth models. The goodness-of-fit and classification success of the past sales growth models are discouraging; and those for anticipated future sales growth are only better because they have the advantage of being able to include immediate past experience of sales growth amongst the independent variables used.

Consider now business performance amongst the small and medium-sized enterprises in the study sample. The logistic regression models developed for annual sales turnover have the following form:

$$\ln[\pi/(1-\pi)] = -3.1663 + 0.5258\text{DEVELPOR} + 2.6096\text{EMPLOY2} + 2.4543\text{EMPLOY3} - 0.2729\text{EXADVICE} \quad \text{Eqn 7.9}$$

where π = probability that annual sales turnover exceeds $5 million

and:

$$\ln[\pi/(1-\pi)] = -5.3337 + 0.8737\text{DEVELPOR} + 2.6276\text{EMPLOY2} + 2.3663\text{EMPLOY3} - 0.2237\text{EXADVICE} \quad \text{Eqn 7.10}$$

where π = probability that annual sales turnover exceeds $10 million

The logistic regression models developed for profitability compared to that of competitors have the following form:

$$\ln[\pi/(1-\pi)] = 0.9811 - 0.3448\text{GRWCONST} + 0.9924\text{LIQCRSD2} + 0.5834\text{SLGRWPD2} \quad \text{Eqn 7.11}$$

where π = probability that profitability is equal to or higher than that of competitors

and:

$$\ln[\pi/(1-\pi)] = -1.8609 - 0.3598\text{GRWCONST} + 0.7507\text{LIQCRSD2} + 1.0581\text{S\_GRWPD2} \quad \text{Eqn 7.12}$$

where π = probability that profitability is higher than that of competitors

Finally, the logistic regression models developed for the recency of having experienced an unexpected liquidity crisis have the following form:

$$\ln[\pi/(1-\pi)] = 0.5828 - 0.4999\text{GRWCONST} - 0.3075\text{EXFINDEP} + 0.5553\text{PROFITD2} \quad \text{Eqn 7.13}$$

where π = probability that an unexpected liquidity crisis has not occurred in the last year

and:

$$\ln[\pi/(1-\pi)] = -0.4612\text{GRWCONST} - 0.2966\text{EXFINDEP} + 0.6640\text{PROFITD2} \quad \text{Eqn 7.14}$$

where π = probability that an unexpected liquidity crisis has not occurred in the last two years

The explanatory factors for business performance that have emerged in the models seem to make business sense and are not inconsistent with prior scholarly knowledge in the area. As with the sales growth models though, the comprehensiveness of financial reporting practices does not feature as an independent variable in any of the business performance models. The goodness-of-fit and classification success of the annual sales turnover models are encouraging; but those for profitability compared to that of competitors and for the recency of having experienced an unexpected liquidity crisis are less so.

To finish, logistic regression modelling has provided further support for the perception that enterprise size in employment terms has some explanatory potential for relevant phenomena in the small and medium-sized enterprises investigated. Statistically significant associations with enterprise size in employment terms are evident in models reported for the following dependent variables:

- Financial reporting practices – indirectly through the independent variable capturing development orientation.
- Past sales growth – indirectly through the independent variable capturing development orientation, and directly through the independent variable distinguishing small from medium-sized enterprises.
- Anticipated future sales growth – indirectly through the independent variable capturing development orientation, and directly through the independent variable distinguishing small from medium-sized enterprises.
- Annual sales turnover – indirectly through the independent variable capturing development orientation and directly through independent variables reflecting employment numbers.

Again, there is a suggestion that the distinction between small and medium-sized enterprises is an important one in the context examined.

7.4 Chapter Review

This chapter of the thesis has sought to provide a detailed and insightful analysis of the data obtained from the Australian Manufacturing Council's *Best Financial Practice* survey. Rather full summaries have already been provided for both the dimensional reduction/structural escalation of data section and the multivariate predictive modelling section of the chapter. Since further summarisation would largely overlap the role of the next and final chapter of the thesis as regards appreciation of the research findings, this will not be undertaken. However, some anticipation of the approach and content of the last chapter is perhaps appropriate.

While the findings of the study have been presented in some depth, it remains to interpret and appraise their significance in light of the principal research question for the investigation and the key objectives that stem from it. The limitations imposed by the approach and method employed also need to be considered. Only then can a balanced

assessment be made of the extent to which the research has achieved its aims. At this point, some success can be claimed in addressing the first part of the principal research question: discovering which enterprise and financial management characteristics seem to most influence financial reporting practices adopted in small and medium-sized manufacturing enterprises legally organised as proprietary companies in Australia. An outcome has also been achieved in addressing the second part of the principal research question: discovering what impact, if any, financial reporting practices appear to have on achieved business growth and performance in small and medium-sized manufacturing enterprises legally organised as proprietary companies in Australia. However, the result is negative in the sense that little such influence can be found for financial reporting practices upon any of the business growth and performance measures examined.