PART III

EXPERIMENTAL RESEARCH SECTION

Chapter 5: CE measurement instrument development and validity testing

5.1 Introduction

This chapter marks the beginning of the experimental research section of the present study. In this section, Chapter 5 seeks to confirm the validity and reliability of the empirical research instrument used. Chapter 6 begins with an overview of the statistical tools and techniques used to analyse research data and contains the analysis of the results of the ex-ante assessment of corporate entrepreneurship environment and training needs of the experimental DFI, the Development Bank of Southern Africa. Chapter 7 details the CE and corporate venture training intervention applied to the experimental DFI and records the direct new venture outcomes of such an intervention. Chapter 8 contains the analysis of the results of the ex-post assessment of the corporate entrepreneurship environment at the same experimental DFI. This chapter seeks to disprove the research proposition: that after the CE training intervention, there is **not** a statistically significant change of CE opinions of the study observation groups.

5.2 Developing the innovation and corporate entrepreneurship measurement instrument

The instrument used to diagnose the DFI organisational factors that foster or hinder innovation and corporate entrepreneurship was developed by adapting the Corporate Entrepreneurship Assessment Index (CEAI) developed by Hornsby et al. (1990), which is used in similar studies worldwide, and a previously untested DBSA innovation diagnostic questionnaire. The first five constructs of the questionnaire, i.e. C1: Management support for Corporate Entrepreneurship; C2: Work discretion; C3: Rewards/Reinforcements; C4: Time availability; and C5: Organisational boundaries, barriers and bureaucracies, were sourced from the CEAI. The remaining three constructs, i.e. C6: Successful technology

enablement; C7: Innovation process; and C1: Innovation portfolio, were adapted from DBSA's innovation diagnostic instrument. The remaining two constructs, i.e. C6: Innovation organisational support; and C7: Innovation portfolio management, were adapted from the DBSA's innovation diagnostic instrument.

The questionnaire consists of 48 diagnostic questions (questions 1 to 48), 6 biographic information questions (questions 49 to 54) and 3 open-ended questions (questions 55 to 57).

5.3 Statistical techniques for confirming validity and reliability

5.3.1 Selecting a multivariate technique

The objective is to determine if the measurement instrument variables could be reduced to a smaller set of variables that could account for most of the variations among respondents. Table 5.1 was used as a guide for choosing an appropriate technique to 'focus upon, and bring out in bold relief, the structure of simultaneous relationships among three or more phenomena' (Sheth, 1977: 3, in Cooper & Schindler, 2003: 611).

Table 5.1: Selecting from the most common multivariate techniques

No dependent variables	**Interdependence of variables is assumed**	
Metric IV	❖ **Factor Analysis** ❖ Cluster Analysis ❖ Multidimensional Scaling	
Non Metric IV	❖ Non metric Cluster Analysis ❖ Non metric Factor Analysis	
One dependent variable (One DV)	**Metric DV**	**Non Metric DV**

Metric IV	❖ Multiple Regression ❖ Multiple Classification Analysis (**MCA**) ❖ Automatic Interaction Detection (**AID**)	❖ Multiple Discriminant Analysis **(MDA)**
Non Metric IV	❖ Multiple Regression *with dummy variables*	❖ Multiple Classification Analysis *with dummy variables*
Two or more dependent variables (>2 DV)	**Metric DV**	**Non Metric DV**
Metric IV	❖ LISREL	❖ Conjoint Analysis
Non Metric IV	❖ MANOVA	❖ Conjoint Analysis

Understanding the distinction between the concepts of dependency and interdependency is an a priori condition for applying Table 5.1.

The fact that the variables being tested in the study are interrelated, without some being designated as dependent and others as independent, allowed for an assumption of interdependence of variables. Furthermore, based on the measurement scale and the type of data collected by the measurement instrument, i.e. ratio data, the data are decidedly metric. These decisions led to the choice between the factor analysis technique, the cluster analysis technique, and the multidimensional scaling technique.

5.3.2 Factor analysis technique

Factor analysis is a technique that that allows for the reduction of a large number of variables or questions (i.e. 48 questions in this study) to a smaller number of variables, 'super variables' or 'latent variables' or factors (seven factors in this study). It does this by attempting to account for the pattern of correlations between the variables in terms of the factors. Factor analysis groups variables with similar characteristics together. In other words, it explains a pattern of

similarity between observed variables. Questions or variables which belong to one factor are highly correlated with one another and have overlapping measurement characteristics. The resultant smaller number of factors are then capable of explaining the observed variance in the larger number of variables and can be used for further analysis.

Numerical values from a factor analysis are correlation coefficients between the factor and the variables, and such correlation coefficients are called *loadings*. In order to find 'pure' constructs underlying each factor, the SAS program (1988) *rotates* the factor loadings such that some pattern is found in which one factor is heavily loaded (has a high correlation coefficient) on some variables, and another factor is heavily loaded on other variables, and so on.

5.3.2.1 Rotated factor analysis results for O_1

Tables 5.2 and 5.3 below show original factor loading matrices that were produced by the SAS program (1988). The columns show variances explained by factors. The rows indicate the original variables as grouped under the original five constructs in Morris and Kuratko's Corporate Entrepreneurship Assessment Instrument (CEAI) (Morris & Kuratko, 2002: 295), and as grouped under an additional two constructs added to place additional emphasis on innovation.

Section 1: Corporate entrepreneurship assessment section

It is apparent from Table 5.2 that only three out of five constructs equal the anticipated factors, i.e. Construct 1 (Management support), Construct 2 (Work discretion) and Construct 4 (Time availability). The interpretation of the results of the factor analysis on all five constructs under section 1 is as follows:

Questions 1–11: Questions 1-11 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 1**.

Questions 12–16 &17: Questions 12 -16 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 2**.

However, the factor analysis indicates that question 17, *'I seldom have to follow the same work methods or steps for doing my major tasks from day to day'*, is testing for the Organisational boundaries and barriers construct (Construct 5) and not for the Work discretion construct (Construct 2) as suggested by Morris and Kuratko (2002: 295). Question 17 has strong overlapping characteristics with questions 28 and 29, which have high factor loadings for Factor 5. Question 17 will therefore be reclassified under the Boundaries and barriers construct (Construct 5) and will be analysed under **Factor 5**.

Question 18–22: Questions 18-19 and question 21 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 3**.

Question 20 *'individuals receive additional rewards…'* The factor analysis indicates that the subjects construed the 'additional reward' variable as a form of management support or as possessing similar characteristics to those possessed by variables under the Management support construct (C1). However, question 20 is a Reward/Reinforcement variable and clearly possesses similar characteristics to other questions of a reward and reinforcement nature This variable will be further rotated and analysed under the Rewards/Reimbursement construct (C3) or as **Factor 3**.

Question 22, *'there are a lot of positive challenges in my job'*, has been loaded under Factor 2, as it can easily be viewed as similar to 'autonomy' questions under the Work discretion construct (C2). In line with its factor loading, this question will be reclassified under the Work discretion construct (C2) and analysed under **Factor 2.**

Questions 23–26 & 27: Questions 23-26 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 4**.

As a result of the frequency analysis, question 27 had more than 5 missing responses and was therefore deleted from Construct 4. It will therefore not be analysed.

Questions 28–29; 30; 31-34: Questions 28-29 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 5**.

Question 30, '*My job description allows for me to come up with ideas and be innovative'*, sounds more like a Work discretion (C2) question, such as question 16, 'to autonomy in job and being left on own to do own work', and was therefore loaded under Factor 2. In line with its factor loading, this question will therefore be reclassified under the Work discretion construct (C2) and analysed under **Factor 2.**

Questions 31-34 are all loaded under and are construed to test for Rewards and Reinforcements (C3). Reading the questions closely, it seems that the ongoing or frequent involvement of manager/supervisor to clarify work expectations causes the questions to be construed as C3. Questions 31-34 will therefore be reclassified under the Rewards/Reinforcements construct (C3) and analysed under **Factor 3.**

The questionnaire will be modified for the reclassification of questions 17, 22, 30 and 31-34, and for the deleted question 27, before it is administered again for the second observation (O_2). Table 5.2 illustrates such reclassifications. The second observation will also confirm whether or not there are significant differences between the South African DFI subjects and the subjects (presumably American) who were used in validating the original questionnaire.

Table 5.2: Corporate Entrepreneurship assessment section

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Construct 1: Management support					
V1	0.609				
V2	0.530				
V3	0.500				
V4	0.599				
V5	0.738				
V6	0.779				
V7	0.772				
V8	0.700				
V9	0.629				
V10	0.648				
V11	0.399				
Construct 2: Work discretion					
V12		0.554			
V13		0.287			
V14		0.693			
V15		0.779			
V16		0.682			
V17 *Reclassify under* ***construct 5***					0.482
Construct 3: Rewards/Reinforcements					
V18			0.377		
V19		0.375	0.418		
V20 *Rotate under* ***factor 3***	0.405				
V21			0.581		
V22 *Reclassify under* ***construct 2***		0.456			
Construct 4: Time-availability					
V23				0.524	
V24				0.948	
V25				0.652	
V26				0.342	
V27	deleted	Deleted	Deleted	deleted	deleted
Construct 5: Organisational boundaries/barriers					
V28					0.657
V29					0.612
V30 *Reclassify under* ***construct 2***		0.399			
V31			0.812		
V32 *Reclassify under* ***construct 3***			0.558		
V33			0.716		
V34			0.594		

Section 2: Innovation diagnostic section

It is apparent from Table 5.3 below that the two constructs under section 2 of the questionnaire equal the anticipated factors, i.e. Construct 6 (Innovation organisational support) and Construct 7 (Innovation portfolio management). The interpretation of the results of the factor analysis on the two constructs under section 2 is as follows:

Questions 35–43: Questions 35-43 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 6**.

Questions 44–48: Questions 44-48 are highly correlated with one another and have overlapping measurement characteristics and therefore represent variables which belong to one factor, **Factor 7**.

Table 5.3: Innovation diagnosis section

	Factor 1	Factor 2
Construct 1: Innovation organisational support		
V35	0.543	
V36	0.727	
V37	0.723	
V38	0.792	
V39	0.652	
V40	0.701	
V41	0.705	
V42	0.640	
V43	0.558	0.287
Construct 2: Innovation portfolio management		
V44	0.278	0.623
V45		0.717
V46		0.961
V47		0.936
V48		0.854

5.3.2.2 Derived rotated factor analysis results

Table 5.4 and Table 5.5 below show the original factor loading matrices as produced by the SAS program (1988). However, to arrive at the derived rotated factors, some variables that formed the original classification were dropped and some were reclassified into new factors. The reclassifications per the factor analysis were carefully interpreted to make sure that they fitted the label of the factor. The labels in turn were checked to ensure that they truly reflected the latent construct.

The columns, titled factors, appear in decreasing order of variance explained by factors. The rows indicate reconstituted constructs that are made up of reclassified original variables as contained in Morris and Kuratko's Corporate Entrepreneurship Assessment Instrument (CEAI) (Morris & Kuratko, 2002: 295), and two additional constructs that are made up of new variables designed to place additional emphasis on innovation.

The modified classification of factor loadings has been rearranged so that for each successive factor only loadings equal to or greater that 0.3000 are reflected in descending order. Loadings less than 0.3000 have been replaced by zeros.

Table 5.4: Derived rotated factor loading matrix for observation 1: Corporate Entrepreneurship assessment section

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Construct 1: Management support					
V6	0.779	0.000	0.000	0.000	0.000
V7	0.772	0.000	0.000	0.000	0.000
V5	0.738	0.000	0.000	0.000	0.000
V8	0.700	0.000	0.000	0.000	0.000
V10	0.648	0.000	0.000	0.000	0.000
V9	0.629	0.000	0.000	0.000	0.000
V1	0.609	0.000	0.000	0.000	0.000
V4	0.599	0.000	0.000	0.000	0.000
V2	0.530	0.000	0.000	0.000	0.000
V3	0.500	0.000	0.000	0.000	0.000
V11	0.399	0.000	0.000	0.000	0.000
Construct 2: Work discretion					
V15	0.000	0.779	0.000	0.000	0.000
V14	0.000	0.693	0.000	0.000	0.000
V16	0.000	0.682	0.000	0.000	0.000
V12	0.000	0.554	0.000	0.000	0.000
V22	0.000	0.456	0.000	0.000	0.000
V30	0.000	0.399	0.000	0.000	0.000
V13	0.000	0.287	0.000	0.000	0.000
Construct 3: Rewards/Reinforcements					
V31	0.000	0.000	0.812	0.000	0.000
V32	0.000	0.000	0.558	0.000	0.000
V33	0.000	0.000	0.716	0.000	0.000
V34	0.000	0.000	0.594	0.000	0.000
V21	0.000	0.000	0.581	0.000	0.000
V19	0.000	0.000	0.418	0.000	0.000
V20	0.000	0.000	0.405	0.000	0.000
V18	0.000	0.000	0.377	0.000	0.000
Construct 4: Time-availability					
V24	0.000	0.000	0.000	0.948	0.000
V25	0.000	0.000	0.000	0.652	0.000
V23	0.000	0.000	0.000	0.524	0.000
V26	0.000	0.000	0.000	0.342	0.000
Construct 5: Organisational boundaries/barriers					
V28	0.000	0.000	0.000	0.000	0.657
V29	0.000	0.000	0.000	0.000	0.612
V17	0.000		0.000	0.000	0.482

Innovation diagnosis section

	Factor 1	Factor 2
Construct 1: Innovation organisational support		
V38	0.792	000
V36	0.727	000
V37	0.723	000
V41	0.705	000
V40	0.701	000
V39	0.652	000
V42	0.640	000
V43	0.558	000
V35	0.543	000
Construct 2: Innovation portfolio management		
V46	000	0.961
V47	000	0.936
V48	000	0.854
V45	000	0.717
V44	000	0.623

Table 5.5: Variance explained by the factor

Factors	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
VP	**4.645**	**3.881**	**3.232**	**2.746**	**1.834**

The VP is the variance explained by the factor. It is computed as the sum of the squares for the variables or elements of the factor's column in the factor loading matrix (SAS computer program, 1988).

Table 5.6: Factor correlations for rotated factors

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1.000				
Factor 2	0.570	1.000			
Factor 3	0.157	0.450	1.000		
Factor 4	0.122	0.334	0.468	1.000	
Factor 5	0.159	0.191	0.117	1.164	1.000

5.3.3 Cronbach's Alpha analysis technique

Cronbach's Alpha is regarded as one of the most important reliability estimates. It measures internal consistency (reliability) by determining the degree to which instrument items are homogeneous and reflect the same underlying construct(s) (Cooper & Schindler, 2003: 237). It detects whether the *indicators of a construct*, also known as variables, have an acceptable fit on a single factor. A Cronbach's Alpha value of above 0.5 is regarded as an indication of reliability.

Cronbach's Alpha analysis is appropriate when individuals respond to items on multiple levels. It is particularly useful for the Likert-type scale mapping rule, i.e. 1- Strongly disagree, 2- Disagree, 3- Not sure, 4- Agree, to 5- Strongly agree, used to measure empirical responses of respondents in the pre-test - post-test observations of the study.

5.3.4 Validity and reliability of questionnaire items (Questions)

Table 5.7 and Table 5.8 present Cronbach Alpha analyses on deleted results of each question of the two sections of the questionnaire. They reflect Cronbach Alpha values that the rest of the questions in the group will accept should one indicated question be deleted.

Table 5.7: Cronbach Coefficient Alpha with deleted variables of Section 1

Constructs	Variables (Questions)	Raw Variables Alpha	Standardised Variables Alpha
C 1: Management support Total Alpha = (Raw = **0.888870**) (Stzd = 0.891409)	V6 V7 V5 V8 V10 V9 V1 V4 V2 V3 **V11**	0.872782 0.876660 0.874360 0.875405 0.874066 0.883495 0.879874 0.880266 0.880559 0.881230 **0.890806**	0.875951 0.879558 0.877226 0.878399 0.877199 0.886374 0.882683 0.883043 0.883589 0.884225 0.890993
C 2: Work discretion Total Alpha = (Raw = 0.823382) (Stzd = 0.823068)	V15 V14 V16 V12 V22 V30 V13	0.784534 0.782252 0.788849 0.798814 0.816784 0.806465 0.817567	0.783914 0.781347 0.788459 0.789041 0.817067 0.805582 0.818516
C 3: Rewards/Reinforcements Total Alpha = (Raw = 0.832951) (Stzd = 0.831943)	V31 V32 V33 V34 V18 V19 V20 V21	0.798667 0.817705 0.800640 0.819389 0.819138 0.813701 0.830530 0.805537	0.798137 0.816664 0.800085 0.818345 0.816835 0.812295 0.830590 0.804203
C 4: Time availability Total Alpha = (Raw = **0.714309**) (Stzd = **0.716088**)	V23 V24 V25 **V26**	0.712315 0.547786 0.584232 **0.735972**	0.710257 0.550891 0.584474 **0.740703**
C 5: Organisational barriers Total Alpha = (Raw = 0.672103) (Stzd = 0.677381)	V28 V29 V17	0.533765 0.560093 0.641735	0.533969 0.565585 0.645575

Table 5.8: Cronbach Coefficient Alpha with deleted variables (questions) of Section 2

Constructs	Variables (Questions)	Raw Variables Alpha	Standardised Variables Alpha
C 6: Innovation organisational support Total Alpha = (Raw = **0.915831**) (Stzd = **0.918801**)	V35 V36 V37 V38 V39 V40 V41 **V42** V43	0.909331 0.904564 0.905345 0.902110 0.906112 0.900985 0.904423 **0.920280** 0.902896	0.912973 0.908590 0.909085 0.905070 0.909210 0.903454 0.908009 **0.922513** 0.906098
C 7: Innovation portfolio management Total Alpha = (Raw = 0.955334) (Stzd = 0.955598)	V44 V45 V46 V47 V48	0.951435 0.942688 0.940709 0.945764 0.943296	0.951551 0.943254 0.940871 0.946060 0.943625
Note: Highlighted deleted variables alphas are higher than construct alphas			

The raw variables Alpha results with deleted variables are compared with the raw variables Cronbach Alpha results of each group of questions (constructs). If the deleted Cronbach Alpha value increases, i.e. is higher than the Cronbach Alpha result of the construct, then that variable is neither reliable nor valid, and can be excluded from further analysis.

Only three (3) out of forty seven (47) variables (questions) were shown not to be reliable; each affected different constructs; and all Cronbach Alpha values were higher than 0.05.

The computed overall alpha value of 0.9254 for the instrument used for Observation 1 indicates a strong internal consistency and a strong degree to which instrument items are homogeneous and reflect the same underlying construct (Cooper & Schindler, 2003: 237).

It is therefore concluded that the questionnaire variables (questions) are reliable; and that the constructs are measuring what they are supposed to measure, indicating a good and reliable instrument.

5.4 Conclusion

The CEAI instrument applied on the pre-test experimental group observation 1 was adapted from Morris and Kuratko (2002: 295). The original instrument was modified by removing some questions that were regarded as superfluous and irrelevant to the South African context and the DFI environment, and by adding additional questions and two completely new 'innovation' constructs. The modified instrument was further refined based on the results of the factor analysis. The refinement resulted from the factor analysis and was in the form of deleting questions that had more than five missing responses and reclassifying others under constructs where they loaded strongly logically, though differently from what was originally anticipated.

The adapted and refined instrument is reliable and valid. It can be applied, in its modified and refined state, on the post-test experimental group (observation 2), on the pre-test comparative group and in other similar research studies.

Having tested the instrument for validity and reliability, the next chapter, Chapter 6, will now analyse the results of the pre-test application of such an instrument (observation 1) on the DBSA (experimental group) and ten other DFIs (the control group).

Chapter 6: Pre-intervention CE assessment (O_1): Comparisons between employee groups of experimental DFI

6.1 Introduction

This chapter analyses the results of the pre-intervention assessment of the corporate entrepreneurship environment and training needs in the experimental DFI.

The statistical tools used to perform statistical comparisons between employee groups are explained first, followed by a summary of the hypotheses to be tested. For the pre-intervention assessment of the CE environment and training needs of the **experimental DFI**, each hypothesis is tested to reach a conclusion as to whether it should be rejected or accepted. The hypothesis testing and discussion format is similar for all hypotheses. The following format is followed: For each entrepreneurship and innovation factor, the respondents' typical perceptions are summarised using descriptive statistics such as the mean and standard deviation; differences between the perceptions of the various stratification groups, i.e. manager and non-manager employees; male and female employees; age groups of employees; experience levels of employees; and employee education levels, are analysed using ANOVA; and where the null hypothesis is rejected, the Scheffe's Test is performed to control for type 1 error, to determine significant differences between the individual mean or means and the consensus value, and to establish the direction of the deviations. The results of the ex ante assessment of the CE environment of the control group DFIs are compared with those of the experimental DFI to ascertain significant differences.

6.2 Statistical significance testing

Testing for statistical significance follows a well-defined process. Cooper and Schindler (2003: 529) recommend a six-stage sequence of steps, as follows:

1. **State the null hypothesis**. Both the null hypotheses and the research or alternative hypotheses are stated in Chapter 1 under section 1.7: Propositions (null hypotheses).

2. **Choose the statistical test**. To test a hypothesis, one must choose an appropriate statistical test from a variety of tests and using a number of criteria that are both measurement-level and testing-situation dependent. Cooper and Schindler (2003) developed a classification of the major parametric and nonparametric significance tests and measures. Such a classification is contained in Table 6.1 below.

Table 6.1: Recommended statistical techniques by measurement level and testing situation

Measurement Level	One-Sample Case	Two-Samples Case		*k*-Samples Case	
		Related Samples	Independent Samples	Related Samples	Independent Samples
Nominal	-Binomial -*Chi-square* One- sample	-McNemar	-Fisher exact test - *Chi-square* Two-samples test	-Cochran	- *Chi-square* *k*-samples
Ordinal	-Kolmogorov-Smirnov one sample-test -Runs test	-Sign test -Wilconox matched-pairs test	-Median test -Mann-Whitney U -Kolmonorov-Smirnov -Wald-Wolfowitz	-Friedman two-way ANOVA	-Median extension -Kruskal-Wallis one-way ANOVA
Interval and ratio	-*t*-test -*Z*-test	-*t*-test for repeated samples	-*t*-test -*Z*-test	-Repeated-measures ANOVA	-One-way ANOVA -*n*-way ANOVA
Source: Cooper & Schindler (2003: 534)					

3. **Select the desired level of significance.** The exact level to choose is largely determined by how much risk there is of accepting the null hypothesis when in truth it should be rejected (type 1 error or **α**). For the purposes of this study, a 5% level of significance is chosen.

4. **Compute the calculated difference value.** After the empirical data have been collected, the significance value (*F*, *t*, Chi-square or other measure) is calculated, based on the significance test chosen under step 2 above. For the purposes of this study, the SAS (1988) computer program used computed the significance values.

5. **Obtain the critical test value.** After the difference value (*F* or other) is calculated, the critical value is obtained from the appropriate table for that distribution.

6. **Interpret the test.** For this step, the conclusion is stated in terms of rejecting or not rejecting the null hypothesis, depending on whether or not the calculated value (step 4) is more extreme than the critical value (step 5).

6.2.1 Probability values (P-Values)

There are several ways of carrying out hypothesis testing. One can carry out a formal test using Cooper and Schindler's (2003: 529) six-step procedure described above, or one can compute a *p*-value to do the test, or one can use a confidence interval as a hypothesis test. These methods are equivalent to one another and they will all lead to the same conclusion. The formal, six-step method is easiest to grasp initially; the *p*-value method is commonly used by computer statistical analysis packages such as the SAS program (1998); and the confidence interval approach is easy to interpret (Hildebrand & Ott, 1996: 249).

The *p*-value indicates the weight of evidence, or the conclusiveness index for rejecting a null hypothesis. In other words, the p-value is the probability (assuming a H_0) of a test statistic value equal to or more extreme than the actual observed value. Therefore, the Universal Rejection Region is stated as:

Reject the null hypothesis if, and only if, the p-value is less than α.

Bearing in mind the basic hypothesis-testing strategy of trying to support the research hypothesis and reject the null hypothesis by showing that the data are highly unlikely, assuming that H_0 is true, the *p*-value is interpreted as follows:

> *The farther within the rejection region the test statistic falls, the smaller the p-value is, and the stronger evidence there is to reject the null hypothesis and support the research hypothesis* (Hildebrand & Ott, 1996: 260).

The SAS (1998) program works out the p-values that automatically incorporate the values in the F statistical tables. The p-value method will be used to interpret the results of the empirical section of this study.

6.2.2 Analysis of variance (ANOVA)

One of the most notable trends in management over the past few decades has been the use of scientifically controlled and carefully designed experiments. Controlled experiments are especially useful to management in the assessment of the likely effect of changes. The improvement in management trends lies in the fact that well-designed experiments convert a discussion from speculative opinion to the assessment of actual data (Hildebrand & Ott, 1996: 354).

Typically the data resulting from an experiment consist of multiple samples. The statistical method for testing the null hypothesis, that the means of several samples of a population or means of populations are equal, is the analysis of variance (ANOVA). The ANOVA method leads to a single statistic for comparing all the means, so the overall risk of type 1 error can be controlled (Hildebrand & Ott, 1996).

The analysis of variance is based on 'taking apart' the variability in the data into the part attributable to variation between groups, and the remaining part attributable to variation within groups. Variation is assessed by sums of squares (SS) (Hildebrand & Ott, 1996).

The test statistic for ANOVA is the *F* ratio. The calculation of an *F* ratio can be computed by the SAS program (1988) and most other statistical packages. To begin with, one (or the computer program) calculates the *total sum of squares* (**SS (Total)**) as the sum of squared deviations of individual values around the grand mean of all the scores. Thus, **SS (Total)** is by definition the sum of all squared deviations around the grand mean, and is partitioned into two components, **SS (Between)** and **SS (Within)** (Hildebrand & Ott, 1996).

SS (Between), also called SS (Factor), is the variability between groups. It is the sum of squared deviations of each group mean from the grand mean, multiplied by the sample size for the group. If the means for the various groups (the various levels of the experimental factor) are nearly the same, there is little variability attributable to the factor, and SS (Between) will be small (Hildebrand & Ott, 1996).

SS (Within) is the variability within groups. If all the data in each group are close together and therefore close to the group mean, then the variances and SS (Within) will be small (Hildebrand & Ott, 1996).

The *degrees of freedom* for SS (Within) can be found by realising that there is *n*-1 d.f. for squared deviations within a group. Similarly, the degrees of freedom for SS (Between) can be found by realising that there is *I*-1 d.f for *I* number of groups. Dividing the sum of squares by their degrees of freedom results in *mean squares* **(MS).** Using this terminology, the ANOVA (test statistic) for testing the equality of I group means is expressed as follows:

T.S. : $F = \frac{\text{MS (Between)}}{\text{MS (Within)}} = \frac{\sum_i n_i (y_i - y)^2 / (I-1)}{\sum_{ij} (y_{ij} - y_i)^2 / (n-I)}$

The rejection rule for the hull hypothesis is expressed as: R.R.: For a specified α, reject H_0 if $F > F_\alpha$, where F_α cuts off a right-tail area of α in the F distribution with *I*-1 numerator and n-1 denominator d.f. (Hildebrand & Ott, 1996: 358)

Large positive values of MS (Between) relative to MS (Within) indicate differences among the population means and lead to the rejection of the null hypothesis (Hildebrand & Ott, 1996).

Like all statistical inference procedures, the *F* test is based on certain assumptions. The three basic assumptions are population normality; equal group variances; and independence of observations The ANOVA is a test on means and therefore the Central Limit Theorem is relevant (Hildebrand & Ott, 1996). For the purposes of this study, there is no problem, as the sample sizes are large.

Changes in an organisation's entrepreneurial climate, attitudes, or behaviours are common areas of interest to organisational behaviour analysts. This study assesses the probable results of a change in training, knowledge, process, or policy, by performing an experiment on carefully chosen samples, making the changes, and measuring the results.

6.2.3 Multiple comparison tests

ANOVA does not indicate which individual mean or means are different from the consensus value and in which direction they deviate. The most effective way to find out is to plot the data or alternatively, but less effectively, to carry out a multiple comparison test such as Scheffe's Test. The Scheffe's Test controls for type 1 error, is conservative and is robust to violations of assumptions.

Multiple comparisons test the difference between each pair of means and indicate significantly different group means at a specified α level. Multiple comparison tests use group means and incorporate MS_{error} term of the *F* ratio. Together they produce confidence intervals for the population means and a criterion score. Differences between the mean values may be compared (Cooper & Schindler, 2003: 551).

The Scheffe's S Test is chosen for the present study to indicate which comparisons are significant at α=0.05 level. Scheffe's Test results also indicate the direction of the difference where the null hypothesis is rejected.

6.2.4 Means and standard deviations

Descriptive statistics such as means and standard deviations are useful in performing an initial summary of the collected data and to check for errors. The mean (X), or arithmetic average, is a common measure of location and has been used in this study to determine a typical (average) response by all respondents to a question. The standard deviation (S) summarises how far away from the average data values typically are.

6.3 Propositions tested

Tables 6.2 and 6.3 reflect a summary of all propositions for the five constructs of section 1 and the two constructs of section 2 of the questionnaire. The tables also indicate the respective sections in which detailed statistical testing analyses are performed in this chapter. For the sake of brevity, only the null propositions, and not the alternative propositions, are summarised.

Table 6.2: Summary of H_0: **B** propositions: Section 1 factors **(**Refer Chapter 1, section 1.7)

Sec.	H_0	There is not a significant difference regarding…	Between manager & non-manager groups (ANOVA)	Between male & female groups (ANOVA)	Between age groups (ANOVA)	Between experien.g roups (ANOVA)	Between educat. groups (ANOVA)
6.4.1	H_0**B** 1	Managerial support for corporate entrepreneur	H_0**B**1.**1**	H_0**B**1.**2**	H_0**B**1.**3**	H_0**B**1.**4**	H_0**B**1.**5**
6.4.2	H_0**B** 2	Work discretion	H_0**B**2.**1**	H_0B2.**2**	H_0**B**2.**3**	H_0**B**2.**4**	H_0**B**2.**5**
6.4.3	H_0**B** 3	Rewards/reinf orcements	H_0**B**3.**1**	H_0B3.**2**	H_0**B**3.**3**	H_0**B**3.**4**	H_0**B**3.**5**
6.4.4	H_0**B** 4	Time availability	H_0**B**4.**1**	H_0B4.**2**	H_0**B**4.**3**	H_0**B**4.**4**	H_0**B**4.**5**
6.4.5	H_0**B** 5	Organisationa l barriers	H_0**B**5.**1**	H_0B5.**2**	H_0**B**5.**3**	H_0B5.**4**	H_0**B**5.**5**
Key: **B** = proposition (H_0) that **there is not a significant difference between the pre-intervention CE opinions of the experimental DFI employee categories regarding the constructs**							

Table 6.3: Summary of H_0: **B** propositions: Section 2 factors (Refer Chapter 1, section 1.7)

Para.	H_0	There is not a significant difference regarding…	Between manager & non-manager groups (ANOVA)	Between male & female groups (ANOVA)	Between age groups (ANOVA)	Between experi-ence groups (ANOVA)	Between educat. groups (ANOVA)
6.4.6	H_0**B**6	Innovation org. support....	H_0**B**6.**1**	H_0**B**6.**2**	H_0**B**6.**3**	H_0**B**6.**4**	H_0**B**6.**5**
6.4.7	H_0**B**7	Innovation portfolio support	H_0**B**7.**1**	H_0**B**7.**2**	H_0**B**7.**3**	H_0**B**7.**4**	H_0**B**7.**5**
Key: **B** = proposition (H_0) that **there is not a significant difference between the pre-intervention CE opinions of the experimental DFI employee categories regarding the constructs**							

6.4 Proposition testing: Pre-intervention comparisons between experimental DFI employee groups

First, for each entrepreneurship and innovation factor, the respondents' typical opinions will be summarised using descriptive statistics such as the mean and standard deviation. The opinion survey instrument used a five-point Likert scale to solicit ratings from the respondents. On such a scale, the middle value is 3, and therefore a mean above 3 is regarded as good and below 3 as not so good.

Second, differences between the mean scores of the various employee category groups, i.e. manager and non-manager employees; male and female employees; age groups of employees; employee experience and employee education levels, will be analysed using ANOVA.

6.4.1 Factor 1: Management support for CE

Table 6.4.1.1: Descriptive statistics on Factor 1: Management support

N	$\overline{X}$	S
312	2.645	0.694

The 312 employee respondents are of the opinion that the organisational support for corporate entrepreneurship at the experimental DFI is below average (2.645 out of 5).

Table 6.4.1.2: Overall ANOVA on Factor 1: Management support

Source of variation	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Value	F Critical Value	P-Value
Between all groups	12	25.975	2.164	5.56	2.32	<0001***
Within groups	281	109.386	0.389			
Total	293	131.362				
*** indicates a statistically significant difference						

Applying the *p*-value approach, the p-value of 0.0001 is < α of 0.05; it is found that there **is** a statistically significant difference between the corporate entrepreneurship opinions of *one or more* of the different employee categories (*managers, non-managers, male, female, different age groups, different experience groups, different education levels)* regarding the Management support factor (Factor 1).

Applying the *F* test: F_{value} of 5.56 is > F_{crit} of 2.32 at α = 0.05 for 12 and 281 (read at df=240) degrees of freedom, a similar conclusion is reached.

The above finding does not indicate which individual mean or means are different from the consensus value and in what direction they deviate. The following more detailed ANOVA, Scheffe's Test and discussion examine for the difference between each pair of means and indicate significantly different stratification group means at a specified α level.

Table 6.4.1.3: ANOVA (between groups) on Factor 1: Management support

Hypothesis	Stratification groups	D.F.	Sum of Squares (SS)	Mean Square (MS)	F Values	P-Value
H_0B1.**1**	Managers and non-managers	1	0.3168	0.3168	0.81	0.3677
H_0B1.**2**	Male and female	1	0.1718	0.1718	0.44	0.5070
H_0B1.**3**	Age groups	3	1.2329	0.4109	1.06	0.3683
H_0B1.**4**	Experience groups	4	10.7476	2.6869	6.90	<0.0001***
H_0B1.**5**	Education levels	3	10.0980	3.3660	8.65	<0.0001***
*** indicates a statistically significant difference at α = 0.05 level						

Applying the *p*-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', Table 6.4.1.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B1.1)**; male and female **(H_0B1.2)**; and various age groups **(H_0B1.3)**, regarding **management support for CE**. Therefore propositions H_0B1.1, H_0B1.2 and H_0B1.3 are **accepted.**

According to this finding, employee job status, gender, and age categories do not play a statistically significant role in employee opinions about management support for corporate entrepreneurship.

Conversely, the following propositions are rejected:

Proposition H_0B1.4: Rejected

There **is** a significant difference between the corporate entrepreneurship opinions of employees with service year ranges *0 to 4* and *5 to 9* and *10 to 14* and *15 to >20* regarding **management support for CE**.

To further analyse the rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), Table 6.4.1.4 contains Scheffe's Test results

indicating significant comparisons, and the direction thereof, of employees experience categories at α of 0.05.

Table 6.4.1.4: Scheffe's comparison between work experience sub-groups on Management support (Factor 1)

Work experience (years) categories	Difference between means	Simultaneous 95% confidence limits		
2 > 4	0.48201	0.06045	0.90357	***
1 > 3	0.37351	0.01877	0.72825	***
1 > 4	0.46656	0.19033	0.74279	***

*** indicates comparisons significant at the 0.05 level

1= 0 to 4 yrs;

2= 5 to 9 yrs;

3= 10 to 14 yrs;

4= 15 to 19 yrs;

The results in Table 6.4.1.4 indicate that employees with 5 to 9 years' experience have a statistically better opinion (mean score) on the construct than those with 15 to 19 years. Moreover, employees with experience of up to 5 years have a statistically better opinion (mean score) than those with 10 years and above.

These results indicate that 'newer' employees (means = 2.8799 (2) and 2.8644 (1)) have a better view of the organisation than the 'more experienced' (means = 2.3978 (4) and 2.4909 (3)) with respect to entrepreneurial management support (Factor 1). This has implications on the retirement/recruitment policies of DFI institutions. Policies that encourage early retirement and external recruitment could be beneficial for corporate entrepreneurship.

Proposition H_0B1.5: Rejected

There **is** a significant difference between the corporate entrepreneurship opinions of employees with education levels: less than *matric* and *matric* and

post matric and *graduate and post graduate levels* regarding **management support for CE**.

To further analyse the rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results indicating significant comparisons of employees' levels of education stratification sub-groups at α = 0.05.

Table 6.4.1.5: Scheffe's comparison between levels of education sub-groups on Management support (Factor 1)

Employee levels of education	Difference between means	Simultaneous 95% confidence limits		
1&2 > 5	0.45353	0.06222	0.84485	***
3 > 5	0.32611	0.06511	0.58711	***
*** indicates comparisons significant at the 0.05 level **1&2**= matric and less than matric; **3**= after matric; **4**= degree; **5**= post graduate				

In table 6.4.1.5, the results indicate that there is a significant difference between employees with qualifications lower than a degree and those that have degrees.

The 'employees without degrees' have a statistically significantly better view of the organisation than 'degreed' employees with respect to entrepreneurial **management support** (Factor 1). This may mean that management does not understand and support 'sophisticated' ideas.

6.4.2 Factor 2: Work discretion

Table 6.4.2.1: Descriptive statistics on Factor 2: Work discretion

N	$\bar{X}$	S
312	3.134	.763

The 312 employee respondents are of the opinion that the work discretion at the DBSA is above average (3.134 out of 5).

Table 6.4.2.2: Overall ANOVA on Factor 2: Work discretion

Source of Variation	D.F	Sum of Squares	Mean Square	F Value	F-Critical Value	P-Value
Between all groups	12	13.849	1.154	2.02	2.32	0.0229***
Within groups	281	160.864	0.572			
Total	293	174.713				
*** indicates a statistically significant difference at α = 0.05 level						

Applying the *p*-value approach, the p-value of 0.0.229 is < α of 0.05; it is found that there **is** a statistically significant difference between the corporate entrepreneurship opinions of *one or more* of the different employee groups (*managers, non-managers, male, female, different age groups, different experience groups, different education levels)* regarding the **work discretion** factor (Factor 2)

The above result does not indicate which individual mean or means are different from the consensus value and in what direction they deviate. The following more detailed ANOVA and Scheffe's Test and discussion examine for the difference between each pair of means and indicate significantly different stratification group means at a specified α level.

Table 6.4.2.3: ANOVA (between groups) on Factor 2: Work discretion

Hypothesis	Stratification Groups	D.F	Sum of Squares	Mean Square	F Values	P-Value
H_0B2.**1**	Managers and non-managers	1	0.3184	0.3184	0.56	0.4564
H_0B2.**2**	Male and female	1	0.0574	0.0574	0.10	0.7517
H_0B2.**3**	Age groups	3	0.3574	0.1191	0.21	0.8907
H_0B2.**4**	Experience groups	4	7.4793	1.8698	3.27	0.0122***
H_0B2.**5**	Education levels	3	4.8315	1.6105	2.81	0.0397***
*** indicates a statistically significant difference at α = 0.05 level						

Applying the p-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', Table 6.4.2.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B2.1)**; male and female **(H_0B2.2)**; and various age groups **(H_0B2.3)**, regarding **work discretion**. Therefore, propositions H_0B2.1, H_0B2.2 and H_0B2.3 are **accepted.**

According to this finding, employee job status, gender and age categories do not play a statistically significant role in employee opinions about work discretion to facilitate corporate entrepreneurship.

However, the following propositions are rejected:

Proposition H_0B2.4: Rejected

There **is** a statistically significant difference between the corporate entrepreneurship opinions of employees with service year ranges *0 to 4* and *5 to 9* and *10 to 14* and *15 to >20* regarding **work discretion**.

To further analyse the rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results indicating significant comparisons of employees' experience categories.

Table 6.4.2.4: Scheffe's comparison between experience sub-groups on Work discretion (Factor 2)

Work experience (yrs) stratification	Difference between means	Simultaneous 95% confidence limits		
2 > 4	0.55870	0.04749	1.06992	***
*** indicates comparisons significant at the 0.05 level **1**= exp 0 to 4yrs; **2**= exp 5 to 9yrs; **3**= exp 10 to 14yrs; **4**= exp 15 to 19yrs; **5**= 20yrs and more				

In Table 6.4.2.4, the results indicate that employees with 5 to 9 years' experience have a statistically significantly better view of the organisation than those with 15 to 19 years with respect to entrepreneurial work discretion (Factor 2).

Proposition H_0B2.5: Rejected

There **is** a statistically significant difference between the corporate entrepreneurship opinions of employees with education levels less than *matric* and *matric* and *post matric* and *graduate and post graduate* regarding **work discretion**.

To further analyse the rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results, indicating that **none** of the comparisons of employees' levels of education stratification sub-groups were significant at α = 0.05.

Table 6.4.2.5: Scheffe's comparison between levels of education sub-groups on Work discretion (Factor 2)

Employee levels of education groups	Difference between means	Simultaneous 95% confidence limits		
1&2 > 5	0.10062	-037392	0.57516	
1&2 > 4	0.29645	-0.24320	0.83611	
1&2 > 3	0.38135	-0.13708	0.89977	
5 > 4	0.19583	-0.15437	0.54604	
5 > 3	0.28073	-0.03579	0.59724	
4 > 3	0.08489	-0.32281	0.49259	
1= less than matric; **2**= matric; **3**= after matric; **4**= degree; **5**= post graduate				

The results indicate a possibility that a true hypothesis may have been rejected. Scheffe's Test results in Table 6.4.2.5 indicate that there **is not** a significant difference between the corporate entrepreneurship opinions of employees with education levels less than *matric* and *matric* and *post matric* and *graduate and post graduate* regarding **work discretion**.

6.4.3 Factor 3: Rewards/Reinforcements

Table 6.4.3.1: Descriptive statistics on Factor 3: Rewards/Reinforcements

N	$\overline{X}$	S
312	3.068	0.782

The 312 employee respondents are of the opinion that rewards/reinforcements at the experimental DFI are average to good (3.068 out of 5).

Table 6.4.3.2: Overall ANOVA Factor 3: Rewards/Reinforcements

Source of Variation	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Value	F Critical Value	P-Value
Between all groups	12	12.6316	1.0526	1.71	2.32	0.0639
Within groups	281	172.8267	0.6150			
Total	293	185.4583				

Applying the *p*-value approach, the p-value of 0.0639 is > 0.05*(α)*, a finding is made that there **is not** a significant difference between the corporate entrepreneurship opinions of any of the different employee categories (*managers, non-managers, male, female, different age groups, different experience groups, different education levels)* regarding **rewards/reinforcements** factor (Factor 3)

The above result is corroborated by the following more detailed ANOVA and discussion of differences between stratification groups on rewards/reinforcements.

Table 6.4.3.3: ANOVA (between groups) on Factor 3: Rewards/Reinforcements

Hypothesis	Stratification Groups	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Values	P-Value
H_0B3.**1**	Managers and non-managers	1	0.4354	0.4354	0.71	0.4008
H_0B3.**2**	Male and female	1	0.2655	0.2655	0.43	0.5116
H_0B3.**3**	Age groups	3	2.9518	0.9839	1.60	0.1896
H_0B3.**4**	Experience groups	4	5.6973	1.4243	2.32	0.0575
H_0B3.**5**	Education levels	3	2.3699	0.7899	1.28	0.2800

Applying the *p*-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', Table 6.4.3.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B3.1)**; male and female **(H_0B3.2)**; various age groups **(H_0B3.3);** work experience groups **(H_0B3.4)**; and education groups **(H_0B3.5),** regarding **rewards/reinforcements**. Therefore propositions H_0B3.1, H_0B3.2, H_0B3.3, H_0B3.4 and H_0B3.5 are **accepted.**

According to this finding, differences within all the employee stratification groups do not play a statistically significant role in employee opinions about rewards/reinforcements for corporate entrepreneurship.

6.4.4 Factor 4: Time availability

Table 6.4.4.1: Descriptive statistics on Factor 4: Time availability

N	$\overline{X}$	S
312	2.553	0.814

The 312 employee respondents are of the opinion that time availability for corporate entrepreneurship at the experimental DFI is below average (2.553 out of 5).

Table 6.4.4.2: Overall ANOVA on Factor 4: Time availability

Source of Variation	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Value	F Critical Value	P-Value
Between all groups	12	13.18038	1.0983	1.69	2.32	0.0688
Within groups	281	182.8028	0.6505			
Total	293	195.9832				

Applying the *p*-value approach, the p-value of 0.0688 is > 0.05 *(α)*, a finding is made that there **is not** a significant difference between the corporate entrepreneurship opinions of any of the different employee categories (*managers, non-managers, male, female, different age groups, different experience groups, different education levels)* regarding the **time availability** factor (Factor 4)

The above result is corroborated by the following more detailed ANOVA and discussion of differences between stratification groups on time availability.

Table 6.4.4.3: ANOVA (between groups) on Factor 4: Time availability

Hypothesis	Stratification Groups	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Values	P-Value
H_0B4.**1**	Managers and non-managers	1	0.1666	0.1666	0.26	0.6132
H_0B4.**2**	Male and female	1	0.0038	0.0038	0.01	0.9389
H_0B4.**3**	Age groups	3	3.9560	1.3186	2.03	0.1103
H_0B4.**4**	Experience groups	4	1.1295	0.2823	0.43	0.7840
H_0B4.**5**	Education levels	3	3.3110	1.1036	1.70	0.1680

Applying the *p*-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', table 6.4.4.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B4.1)**; male and female **(H_0B4.2)**; various age groups **(H_0B4.3);** work experience groups **(H_0B4.4)**; and education groups **(H_0B4.5),** regarding **time availability**. Therefore propositions H_0B4.1, H_0B4.2, H_0B4.3, H_0B4.4 and H_0B4.5 are **accepted.**

According to this finding, differences within all the employee stratification groups do not play a statistically significant role in employee opinions about time availability for corporate entrepreneurship.

6.4.5 Factor 5: Organisational boundaries

Table 6.4.5.1: Descriptive statistics on Factor 5: Organisational boundaries

N	$\overline{X}$	S
312	2.858	0.852

The 312 employee respondents are of the opinion that organisational boundaries against corporate entrepreneurship at the experimental DFI are below average (2.858 out of 5).

Table 6.4.5.2: Overall ANOVA on Factor 5: Organisational boundaries

Source of Variation	(D.F)	Sum of Squares (SS)	Mean Square (MS)	F Value	F-Critical Value	P-Value
Between all groups	12	14.8798	1.2399	1.72	2.32	0.0619
Within groups	281	202.4372	0.7204			
Total	293	217.3170				

Applying the *p*-value approach, the p-value of 0.0619 is > 0.05*(α)*, a finding is made that there **is not** a significant difference between the corporate entrepreneurship opinions of any of the different employee groups (*managers,*

non-managers, male, female, different age groups, different experience groups, different education levels) regarding the **organisational boundaries** factor (Factor 5)

Contrary to the above result, the following more detailed ANOVA and Scheffe's Test and discussion indicate significant differences between some stratification group means at a specified α level.

Table 6.4.5.3: ANOVA (between groups) on Factor 5: Organisational boundaries

Hypothesis	Stratification Groups	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Values	P-Value
H_0B5.**1**	Managers and non-managers	1	1.1535	1.1535	1.60	0.2068
H_0B5.**2**	Male and female	1	0.4300	0.4300	0.60	0.4404
H_0B5.**3**	Age groups	3	1.3460	0.4486	0.62	0.6008
H_0B5.**4**	Experience groups	4	8.1093	2.0273	2.81	0.0257***
H_0B5.**5**	Education levels	3	2.0409	0.6803	0.94	0.4196
*** indicates a statistically significant difference at α = 0.05 level						

Applying the p-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', Table 6.4.5.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B5.1)**; male and female **(H_0B5.2)**; various age groups **(H_0B5.3);** and education level groups **(H_0B5.5),** regarding **organisational boundaries**. Therefore, propositions H_0B5.1, H_0B5.2, H_0B5.3, and H_0B5.5 are **accepted.**

According to this finding, employee job status, gender, age categories and education levels do not play a statistically significant role in employee opinions about organisational boundaries to facilitate corporate entrepreneurship.

However, the following proposition is rejected:

Proposition H_0B5.4: Rejected

There **is** a significant difference between the corporate entrepreneurship opinions of employees with service year ranges *0 to 4* and *5 to 9* and *10 to 14* and *15 to >20* regarding **organisational boundaries**.

To further analyse the rejected hypothesis and to control for type 1 error, the following table contains Scheffe's Test results indicating significant comparisons of employees' experience categories at α = 0.05

Table 6.4.5.4: Scheffe's comparison between experience sub-groups on Organisational boundaries (Factor 5)

Work experience (yrs) groups	Difference between means	Simultaneous 95% confidence limits		
1 > **4**	0.3943	0.0185	0.7700	***
*** indicates a statistically significant difference at α = 0.05 level **1**= exp 0 to 4yrs; **2**= exp 5 to 9yrs; **3**= exp 10 to 14yrs; **4**= exp 15 to 19yrs; **5**= 20yrs and more				

The results indicate that employees with experience of up 5 years have a statistically significantly better opinion with respect to entrepreneurial organisational boundaries (Factor 5) than those with 15 years and above work experience. This has implications on the type of policies followed for recruitment and retirement, and on whom entrepreneurial training for staff should be focused in development finance institutions.

6.4.6 Factor 6: Innovation organisational support

Table 6.4.6.1: Descriptive statistics on Factor 6: Innovation organisational support

N	$\overline{X}$	S
312	2.644	0.770

The 312 employee respondents are of the opinion that the innovation organisational support at the experimental DFI is below average (2.644 out of 5).

Table 6.4.6.2: Overall ANOVA on Factor 6: Organisational innovation support

Source of Variation	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Value	F Critical Value	P-Value
Between all groups	12	35.4552	2.9546	6.02	2.32	<0.0001***
Within groups	281	137.9274	0.4908			
Total	293	173.3827				
*** indicates a statistically significant difference at α = 0.05 level						

Applying the *p*-value approach, the p-value of '<0.0001' is < 0.05 *(α)*, it is found that there **is** a significant difference between the innovation opinions of *one or more* of the different employee categories (*managers, non-managers, male, female, different age groups, different experience groups, different education levels)* regarding the **organisational innovation support** factor (Factor 6)

The above result does not indicate which individual mean or means are different from the consensus value and in what direction they deviate. The following more detailed ANOVA and Scheffe's Test examine for differences between each pair of means and indicate statistically significantly different group means at a specified α level.

Table 6.4.6.3: ANOVA (between groups) on Factor 6: Organisational innovation support

Hypothesis	Stratification Groups	D.F.	Sum of Squares (SS)	Mean Square(MS)	F Values	P-Value
H_0B6.**1**	Managers and non-managers	1	0.4786	0.4786	0.98	0.3242
H_0B6.**2**	Male and female	1	0.2536	0.2536	0.52	0.4729
H_0B6.**3**	Age groups	3	0.1660	0.0553	0.11	0.9526
H_0B6.**4**	Experience groups	4	6.0233	1.5058	3.07	0.0170***
H_0B6.**5**	Education levels	3	16.4947	5.4982	11.2	<0.0001***
*** indicates a statistically significant difference at α = 0.05 level						

Applying the p-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', Table 6.4.6.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B6.1)**; male and female **(H_0B6.2)**; and various age groups **(H_0B6.3)**, regarding **organisational innovation support**. Therefore, propositions H_0B6.1, H_0B6.2 and H_0B6.3 are **accepted.**

According to this finding, employee job status, gender and age categories do not play a statistically significant role in employee opinions about organisational support for innovation.

However, the following propositions are rejected:

Proposition H_0B6.4: Rejected

There **is** a significant difference between the opinions of employees with work experience year ranges *0 to 4* and *5 to 9* and *10 to 14* and *15 to >20* regarding **organisational innovation support**.

To further analyse this rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results

indicating significant comparisons of employees' experience categories at α = 0.05

Table 6.4.6.4: Scheffe's comparison between experience sub-groups on Organisational innovation support (Factor 6)

Work experience (yrs) groups	Difference between means	Simultaneous 95% confidence limits		
1 > 4	0.34211	0.03194	0.65229	***
*** indicates a statistically significant difference at α = 0.05 level **1**= exp 0 to 4yrs; **2**= exp 5 to 9yrs; **3**= exp 10 to 14yrs; **4**= exp 15 to 19yrs; 5= 20yrs and more				

The results in Table 6.4.6.4 indicate that employees with work experience of up to 5 years have a statistically better opinion of the organisation than those with work experience of 10 to 19 years ('more experienced' employees) with respect to organisational innovation support (Factor 6).

One of the implications of this finding is that a DFI with relatively 'newer' employees would do better on innovation than a DFI that has employees with long experience. These 'newer' employees do not necessarily have to be younger in age. Where innovation and corporate entrepreneurship are a pillar of corporate strategy, the recruitment and retirement policies, as well as the focus of entrepreneurial training for staff, must take account of this finding.

Proposition H_0B6.5: Rejected

There **is** a significant difference between the opinions of employees with education levels less than *matric* and *matric* and *post matric* and *graduate and post graduate* regarding **organisational innovation support**.

To further analyse the rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results indicating significant comparisons of employees' experience categories at an α of 0.05

Table 6.4.6.5: Scheffe's comparison between levels of education sub-groups on Organisational innovation support (Factor 6)

Employee levels of education	Difference between means	Simultaneous 95% confidence limits		
1&2 > 4	0.54147	0.04176	1.04117	***
1&2 > 5	0.81461	0.37521	1.25402	***
3 > 5	0.57782	0.28474	0.87090	***
*** indicates a statistically significant difference at α = 0.05 level **1**= less than matric; **2**= matric; **3**= after matric; **4**= degree; 5= post graduate				

The results in Table 6.4.6.5 indicate that employees without a degree have a statistically significantly higher opinion of the organisation than employees with degrees and higher education levels with respect to organisational innovation support (Factor 6). This may mean that management does not understand and support 'sophisticated' innovations.

6.4.7 Factor 7: Innovation portfolio management

Table 6.4.7.1: Descriptive statistics on Factor 7: Innovation portfolio management

N	X	S
312	2.500	0.839

The 312 employee respondents are of the opinion that the innovation portfolio management at the experimental DFI is below average (2.500 out of 5).

Table 6.4.7.2: Overall ANOVA on Factor 7: Innovation portfolio management

Source of Variation	Degrees of Freedom (D.F)	Sum of Squares (SS)	Mean Square (MS)	F Value	F Critical Value	P-Value
Between all groups	12	36.5408	3.0450	5.05	2.32	<0.0001***
Within groups	281	169.3579	0.6026			
Total	293	205.8987				
*** indicates a statistically significant difference at α = 0.05 level						

Applying the *p*-value approach, the p-value of '<0.0001' < 0.05 *(α)*, a finding is made that there **is** a significant difference between the innovation opinions of *one or more* of the different employee categories (*managers, non-managers, male, female, different age groups, different experience groups, different education levels)* regarding the **innovation portfolio management** factor (Factor 7)

The above result does not indicate which individual mean or means are different from the consensus value and in what direction they deviate. The following more detailed ANOVA and Scheffe's Test examine for the difference between each pair of means and indicate significantly different stratification group means.

Table 6.4.7.3: ANOVA (between groups) on Factor 7: Innovation portfolio management

Hypothesis	Stratification Groups	D.F	Sum of Squares	Mean Square	F Values	P-Value
H_0B7.**1**	Managers and non-managers	1	0.5978	0.5978	0.99	0.3201
H_0B7.**2**	Male and female	1	0.4878	0.4878	0.81	0.3691
H_0B7.**3**	Age groups	3	1.0307	0.3435	0.57	0.6351
H_0B7.**4**	Experience groups	4	9.3644	2.3411	3.88	0.0043***
H_0B7.**5**	Education levels	3	14.8736	4.9578	8.23	<0.0001***
*** indicates a statistically significant difference at α = 0.05 level						

Applying the p-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', Table 6.4.6.3 results indicate:

That there is **not** a statistically significant difference between: managers and non-managers (**H_0B7.1)**; male and female **(H_0B7.2)**; and various age groups **(H_0B7.3)**, regarding **innovation portfolio management**. Therefore, propositions H_0B7.1, H_0B7.2 and H_0B7.3 are **accepted.**

According to this finding, employee job status, gender and age categories do not play a statistically significant role in employee opinions about innovation portfolio management.

However, the following propositions are rejected:

Proposition H_0B7.4: Rejected

There **is** a significant difference between the opinions of employees with service year ranges *0 to 4* and *5 to 9* and *10 to 14* and *15 to >20* regarding **innovation portfolio management**.

To further analyse this rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results indicating significant comparisons of employees' experience categories at α= 0.05

Table 6.4.7.4: Scheffe's comparison between experience sub-groups on Innovation portfolio management (Factor 7)

Work experience (yrs) groups	Difference between means	Simultaneous 95% confidence limits		
1 > 4	0.3588	0.0151	0.7025	***
*** indicates a statistically significant difference at α = 0.05 level **1**= exp 0 to 4yrs; **2**= exp 5 to 9yrs; **3**= exp 10 to 14yrs; **4**= exp 15 to 19yrs; **5**= 20yrs and more				

Table 6.4.7.4 results indicate that employees with experience of up 4 years' work experience ('newer' employees) have a statistically significantly higher opinion of the organisation than those with 15 to 19 years' work experience, with respect to **innovation portfolio management**.

This finding may mean that where innovation is a strategic thrust in a DFI, external recruitment and early retirement would serve the strategic purpose. It also implies that the focus of innovation portfolio management training for staff should fall more on those with longer work experience.

Proposition H_0B7.5: Rejected

There **is** a significant difference between the opinions of employees with education levels less than *matric* and *matric* and *post matric* and *graduate and post graduate* regarding **innovation portfolio management**.

To further analyse the rejected hypothesis and to control for type 1 error (where a true hypothesis is rejected), the following table contains Scheffe's Test results indicating significant comparisons of employees' experience categories at α=0.05

Table 6.4.7.5: Scheffe's comparison between levels of education sub-groups on Innovation portfolio management (Factor 7)

Employee levels of education	Difference between means	Simultaneous 95% confidence limits		
1&2 > 5	0.78098	0.29407	1.26788	***
3 > 5	0.54385	0.21909	0.86861	***
*** indicates a statistically significant difference at α = 0.05 level **1**= less than matric; **2**= matric; **3**= after matric; **4**= degree; 5= post graduate				

The results indicate that there is a significant difference between the opinions of employees with qualifications of less than a degree and those that have degrees.

These results indicate that employees without degrees have a statistically significantly better view of the organisation than employees with degrees with respect to innovation portfolio management (Factor 7). The narrative comments

on the questionnaire indicate, however, that employees are not familiar with the 'innovation portfolio management' construct.

6.4.8 Summary: Statistical comparisons between experimental DFI employee groups

Table 6.4.8.1 contains a summary of all **PRE group (H_0: B)** propositions contained in Chapter 1 section 1.7. Please remember that propositions contained in section 1.7 in Chapter 1 are divided into three, i.e.:

H_0: **A** for the LITERATURE review;

H_0: **B** for the PRE group; and

H_0: **C** for the POST and CONTROL groups.

Table 6.4.8.1: Summary results on H_0: **B** propositions testing for Section 1

Para.	H_0	There is not a significant difference regarding…	Between manager & non-manager (t-test)	Between male & female groups (t-test)	Between age groups (ANOVA)	Between experien. groups (ANOVA)	Between educat. groups (ANOVA)
6.4.1	H_0B 1	Managerial support…….	H_0B1.**1** **Accepted**	H_0B1.**2** **Accepted**	H_0B1.**3** **Accepted**	H_0B1.**4** **Rejected**	H_0B1.**5** **Rejected**
6.4.2	H_0B 2	Work discretion	H_0B2.**1** **Accepted**	H_0B2.**2** **Accepted**	H_0B2.**3** **Accepted**	H_0B2.**4** **Rejected**	H_0B2.**5** **Rejected**
6.4.3	H_0B 3	Rewards/reinforcements	H_0B3.**1** **Accepted**	H_0B3.**2** **Accepted**	H_0B3.**3** **Accepted**	H_0B3.**4** **Accepted**	H_0B3.**5** **Accepted**
6.4.4	H_0B 4	Time availability	H_0B4.**1** **Accepted**	H_0B4.**2** **Accepted**	H_0B4.**3** **Accepted**	H_0B4.**4** **Accepted**	H_0B4.**5** **Accepted**
6.4.5	H_0B 5	Organisational barriers	H_0B5.**1** **Accepted**	H_0B5.**2** **Accepted**	H_0B5.**3** **Accepted**	H_0B5.**4** **Rejected**	H_0B5.**5** **Accepted**

Table 6.4.8.2: Summary results on H_0: **B** proposition testing for Section 2

Para.	H_0	There is not a significant difference regarding…	Between manager & non-manager groups (t-test)	Between male & female groups (t-test)	Between age groups (ANOVA)	Between experience groups (ANOVA)	Between educat. groups (ANOVA)
6.4.6	H_0B6	Innovation org. support...	H_0B6.**1** **Accepted**	H_0B6.**2** **Accepted**	H_0B6.**3** **Accepted**	H_0B6.**4** **Rejected**	H_0B6.**5** **Rejected**
6.4.7	H_0B7	Innovation portfolio support	H_0B7.**1** **Accepted**	H_0B7.**2** **Accepted**	H_0B7.**3** **Accepted**	H_0B7.**4** **Rejected**	H_0B7.**5** **Rejected**

Tables 6.4.8.1 and 6.4.8.2 above summarise the findings of the **pre-test** diagnosis of employee views on corporate entrepreneurship and innovation constructs respectively.

6.4.8.1 Management support (Construct 1)

The average opinion of employees about management support for corporate entrepreneurship at the experimental DFI was that it was below average at 2.645.

There was no significant difference between the following employee categories in the way that they perceived this construct: *managers and non managers*; *male and female* and *different age groups*.

However, there was a significant difference between the following employee categories in the way that they perceived this construct: employees with *different experience periods* and employees with *varying levels of education*. 'Newer' employees (0 to 9 years) had a better view of the organisation than those with more experience (10 to 19 years). Also, employees without degrees had a better view of the organisation than those with degrees.

6.4.8.2 Work discretion (Construct 2)

The average opinion of employees about entrepreneurship promoting work discretionary practices at the experimental DFI was that it was above average at 3.134.

There was no significant difference between the following employee categories in the way that they perceived this construct: *managers and non managers*; *male and female* and *different age groups*.

However, there was a significant difference between the following employee categories in the way that they perceived this construct: employees with *different experience periods* and employees with *varying levels of education*. 'Newer' employees (5 to 9 years) had a better view of the organisation than those with more experience (10 to 19 years). The multi-comparison results were inconclusive on the significance of the differences between the various education levels of employees.

6.4.8.3 Rewards/Reinforcements (Construct 3)

The average opinion of employees about entrepreneurship-promoting rewards/reinforcement practices at the experimental DFI was that they were above average at 3.068.

There was no significant difference between the employee categories in the way that they perceived this construct.

6.4.8.4 Time availability (Construct 4)

The average opinion of employees about entrepreneurship-promoting time availability practices at the experimental DFI was that they were below average at 2.553.

There was no significant difference between the employee categories in the way that they perceived this construct.

6.4.8.5 Organisational boundaries (Construct 5)

The average opinion of employees about entrepreneurship-enhancing organisational boundaries at the experimental DFI was that they were below average at 2.858.

There was no significant difference between the following employee categories in the way that they perceived this construct: *managers and non managers*; *male and female*; *different age groups* and *varying levels of education*.

However, there was a significant difference between employees with *different experience periods* at the experimental DFI in the way that they perceived this construct.

6.4.8.6 Innovation organisational support (Construct 6)

The average opinion of employees about entrepreneurship-promoting innovation organisational support at the experimental DFI was that it was below average at 2.644.

There was no significant difference between the following employee categories in the way that they perceived this construct: *managers and non managers*; *male and female* and *different age groups*.

However, there was a significant difference between the following employee categories in the way that they perceived this construct: employees with *different experience periods,* and employees with *varying levels of education*. 'Newer' employees (5 to 9 years) had a better view of the organisation than those with more experience (10 to 19 years). Employees without a degree have a statistically significantly better opinion of the organisation than employees with degrees and above, with respect to organisational innovation support.

6.4.8.7 Innovation portfolio management (Construct 7)

The average opinion of employees about entrepreneurship-promoting innovation portfolio management at the experimental DFI was that they were below average at 2.500.

There was no significant difference between the following employee categories in the way that they perceived this construct: *managers and non managers*; *male and female* and *different age groups*.

However, there was a significant difference between the following employee categories in the way that they perceived this construct: employees with *different experience periods* and employees with *varying levels of education*. 'Newer' employees (5 to 9 yrs) had a better view of the organisation than those with more experience (10 to 19 yrs). Employees without degrees have a statistically significantly better view of the organisation than employees with post graduate degrees, with respect to innovation portfolio management.

6.4.8.8 Conclusion

There were five out of seven constructs where propositions for this section were rejected. Only for the rewards/reinforcements and time availability constructs were all the propositions accepted. In all the rejected propositions, length of work experience was a common source of such a significant difference. Level of education was the other source for all but one.

In employee experience categories, 'newer' employees had a statistically significantly better view of the organisation on such constructs than their 'older' (i.e. longer-serving) colleagues. This has implications for the retirement/recruitment policies of DFI institutions, i.e. having policies that encourage early retirement, and using outside recruitment for replacement.

For employee education levels categories, the analysis indicates that employees without degrees have a statistically significantly better view of the organisation on

the identified constructs, except for the work discretion construct, where the results were inconclusive. The narrative comments on the qualitative sections of the questionnaire indicate:

- frustration by higher-educated employees about poor management support and rigid organisational boundaries against the identified corporate entrepreneurship constructs; and
- poor understanding of the innovation constructs by the less educated employees.

It is concluded therefore that:

- Employees who have long employment tenure in DFIs appear set in their conventional ways of doing things. The Innovation and corporate entrepreneurship training interventions may need to be tailored targeted for such employees.
- Higher educated employees either find it difficult to see or think outside established patterns. It could also be that management and organisational support is not suited for their 'innovative' ideas.

Chapter 7: CE training intervention (X)

7.1 Introduction

This chapter describes the actual application of the corporate entrepreneurship and innovation training at the DBSA, the experimental DFI, and the strategic context within which the year-long interventions were introduced, experiences noted and observations made during such interventions. The experiences and observations are based on the training material and first-hand experiences by the researcher, and comments, inputs and appraisal from several sources within the organisation; namely, participants in the training programme, new venture team members, evaluation panellists, business process management professionals, and discussions with management and staff in general.

To validate factors that are perceived to either enhance or inhibit entrepreneurship within the experimental DFI, the training intervention participants' evaluations are summarised. Such evaluation insights corroborate those identified by evaluation reports on other parallel and related components of the all-encompassing change management process.

The synthesis from this analysis contributes to the overall conclusions and recommendations about corporate entrepreneurship approaches in similar corporate environments.

7.2 The entrepreneurship and innovation strategic imperative

External and start-up entrepreneurs who become highly successful as a result of their grit and determination are generally envied and perhaps emulated. It is documented in literature that having a few such people inside an organisation might bring a breath of fresh air, innovation and challenge to bureaucratic barriers to opportunity seeking (Timmons, 1999; Bartlett & Ghoshal, 2002, Nijhof et al., 2002).

There is a proliferation of literature, including Schrage (2000), on empirical examples of companies with a long history of innovation- and opportunity-focus as corporate values, who then tried to institutionalise such values in order to instil corporate entrepreneurship into their bureaucratic cultures**.** There is, however, relatively little empirical evidence regarding the success or failure of such efforts. In the following examples of organisations that have tried to instil the entrepreneurship culture, Thornberry (2003: 333-336) gives an overview of different corporate entrepreneurship training approaches, programme designs and possible outcomes.

7.2.1 SNI and Mott's examples

Both Siemens-Nixdorf Information Systems Company (SNI) and Mott's followed a corporate venturing approach to promoting corporate entrepreneurship within their respective companies.

SNI approached Babson College in 1995 with a request for a proposal to design and deliver a management education programme for its unit managers. The purpose of the programme was to create a group of 300 corporate entrepreneurs within SNI. This was a key component of SNI's change management programme (already under way) aimed at turning a staid, conservative, risk-averse culture into a more opportunistic, market focused, fast, flexible organisation that would compete more effectively in its market.

The SNI programme was carried out over a two-year period and focused on entrepreneurial *thinking* and *acting*. Each staff participant was asked to work on an intense project, which involved the real identification of a new venture, development of a formal business plan, presentation to the executive board, and competition for internal venture capital.

Mott's, in its programme, aimed to create new businesses and new markets in order to meet an agreed aggressive goal of doubling shareholder value every three years. Mott's realised that such a goal would not be reached through its

conservative, albeit successful, organisation. It needed to develop a more creative, innovative and entrepreneurial culture. Mott's, unlike SNI, opened up the entrepreneurship programme to any employees in the company who had entrepreneurial tendencies and trained them in entrepreneurial *thinking* and *acting*. The intention was that they would then be able to identify, develop, and capture new business opportunities.

Mott's programme was similar to that of SNI but had a much shorter duration. It revolved around the three major activities of entrepreneurs: opportunity identification; shaping; and capturing. It approached the programme much as a venture capitalist would. That is, if no venture proposals emanated from the first module on 'opportunity identification', then either more time would be spent on ideation or further investment would cease.

7.2.2 PDVSA and Colonia-Axa Insurance examples

PDVSA and Colonia-Axa aimed at creating entrepreneurially-minded managers who would be more attuned to new market opportunities and would stimulate a more innovative and risk-taking culture. The hope was that the resultant change in the managers' behaviour and entrepreneurial orientation would eventually *'trickle down'* to the rest of their respective organisations.

While the content of the PDVSA and Colonia-Axa training programmes was similar to that of SNI and Mott's programmes, the approach was to teach managers not to be corporate venturers themselves, but to spur more opportunity focus and orientation within their respective companies as a whole. Therefore, the goal was for these managers to act as catalysts and coaches for more entrepreneurial thinking and acting. This approach is supported by a study by Pearce et al. (1997), which has shown that managers who adopt more entrepreneurially-focused behaviours, such as encouraging the destruction of red tape or encouraging staff to try new ways of doing their work, can have an impact on employee satisfaction as well as the company's bottom line.

7.2.3 Summary of findings from the four examples

Thornberry (2003: 335) highlights two main findings from the above four examples: much of what start-up entrepreneurs do can be taught to relatively ordinary but motivated corporate individuals; and some of the business plans developed as part of the training programmes do eventually result into successful businesses.

7.3 Innovation and CE strategic foci

The experimental DFI Vision 2014 corporate strategy stresses the organisation's commitment to innovation and creativity. This is evidenced by the inclusion of 'innovation and corporate entrepreneurship' as one of seven mutually supportive strategic thrusts to underpin Vision 2014. The other six strategic thrusts addressed: risk taking and risk management; knowledge management; strong and smart partnerships; performance recognition and rewards; alignment of strategy structure and processes; and black economic empowerment.

This entrepreneurial strategic posture was assumed in response to the persistent poverty and backlogs in the delivery of basic services in the Southern African Development Community (SADC) region. Also, commercial institutions were becoming more aggressive in their competition with the experimental DFI for the financing of development projects. These and other external push factors spurred the DFI to introduce a change management programme, of which innovation and corporate entrepreneurship were cornerstones.

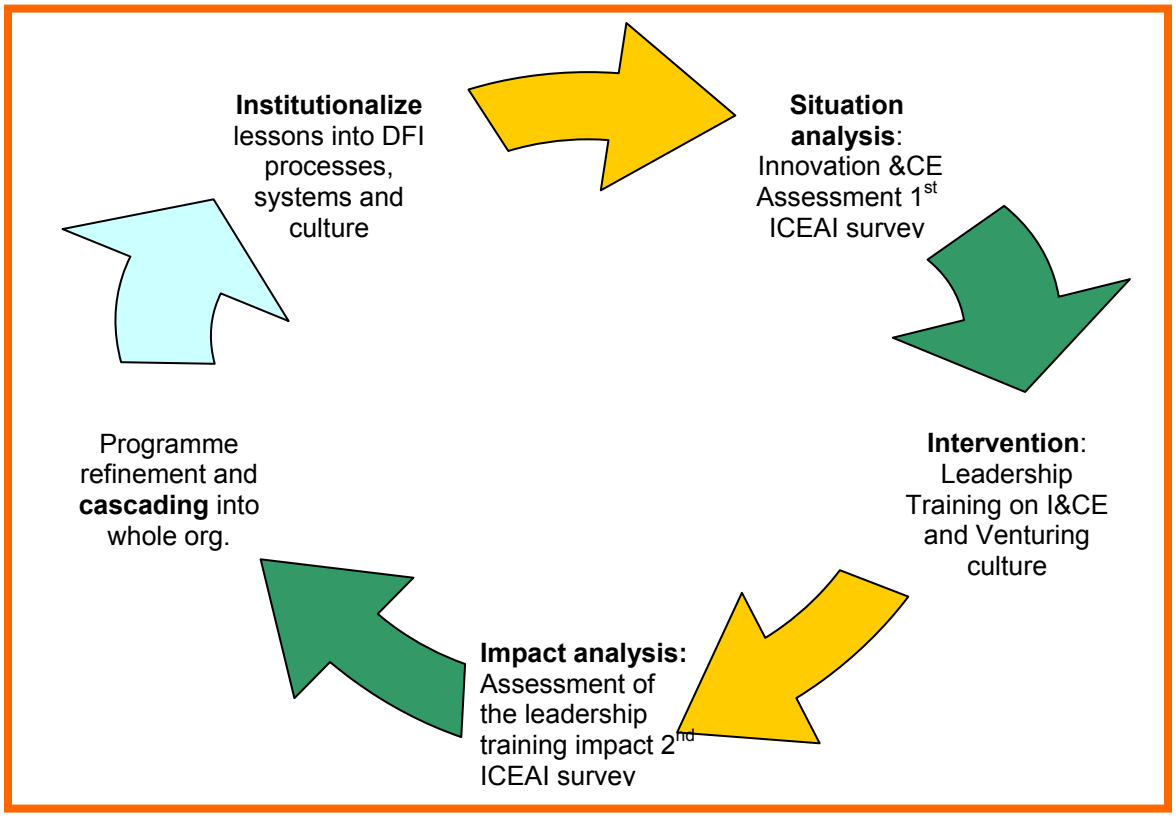
Top management started the change management process by sending out to the organisations messages such as 'think outside the box', 'business as usual is not enough', 'the biggest risk is not taking one', 'mistakes committed in good faith and with good intentions will not be punished but should not be repeated'. An entrepreneurial way of achieving organisational goals was encouraged and promoted through a number of change management interventions which also called for better communication, leadership and the revision of corporate values.

The core purpose of these interventions was to ensure that new ideas were strategically consistent with the DFI vision and mission and that they enhanced its mandate execution.

7.4 Innovation and corporate entrepreneurship process

In order to develop and apply the innovation and entrepreneurial interventions, a holistic process approach was adopted, as demonstrated below.

Figure 7.1: Innovation and CE approach process flow



Source: Adapted from a compilation by Kgarimetsa-Phiri (2006)

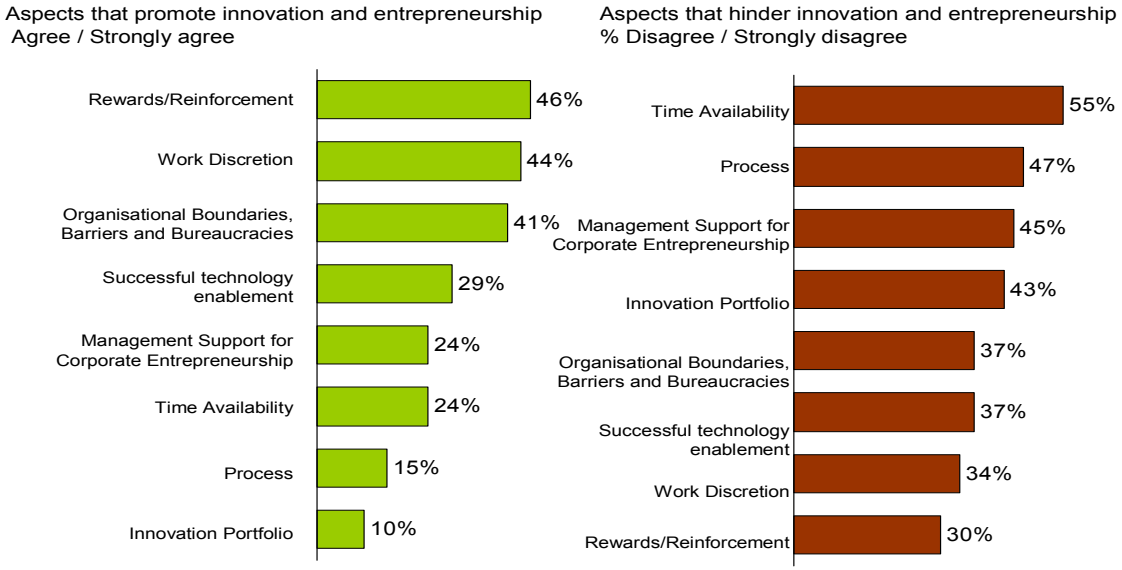
7.4.1 Situation analysis

As discussed in Chapter 6, the researcher conducted an assessment of the state of innovation and corporate entrepreneurship at the experimental DFI by

measuring employee opinions and feelings in this regard. Staff perceptions were surveyed in March 2005 through the Innovation and Corporate Assessment Instrument (ICEAI), a diagnostic questionnaire.

The dichotomously presented results of the ICEAI are depicted in Figure 7.2 below, and revealed that, generally, knowledge on innovation and corporate entrepreneurship was medium to low and that there was a need to increase staff's exposure in this regard.

Figure 7.2: Situation analysis overall results



Which aspects of the workplace and organisation promote, or hinder, innovation and corporate entrepreneurship? (n=322)

Aspects in which at least 50% of the respondents agreed or strongly agreed with statements in each dimension (or at least 44%, where 35% or fewer disagreed or strongly disagreed) are depicted as promoting entrepreneurship and innovation in Figure 7.2.

Aspects in which at least 50% of the respondents disagreed or strongly disagreed with statements in each dimension (or at least 44%, where 35% or

fewer agreed or strongly agreed), are depicted as barriers to entrepreneurship and innovation in Figure 7.2.

It therefore appears that employees feel positive about aspects that relate to general job satisfaction such as: work discretion; rewards and reinforcements; and existing organisational boundaries, barriers and bureaucracies. They know what level of work experience is expected from them and feel that their managers keep to those parameters when evaluating their job performance.

The corollary is that employees feel that aspects that hinder entrepreneurship and innovation are: lack of time availability for innovation; lack of a clear process flow; and lack of management support for corporate entrepreneurship. Many employees also do not seem to understand the concept of innovation portfolio management.

It is on the basis of these results that a targeted training intervention was conceived and designed.

7.4.2 Leadership training

The researcher advised the experimental DFI to approach the University of Pretoria (UP), as in the case of the SNI example presented in 7.2.1 above. The UP was asked to design and deliver a corporate entrepreneurship and innovation training programme that would address the results of the ICEAI questionnaire. The training started with the leadership group In July 2005. One hundred and four (104) members of the leadership group were trained on corporate entrepreneurship and innovation.

The training of the leadership group was an acknowledgment of their change agency status in the organisation and was aimed at capacitating them to provide staff with the required support for innovation and entrepreneurship. In addition to the promotion of knowledge about entrepreneurship and innovation, a corporate venturing culture was fostered within the leadership group.

Cascading of the training programme in a condensed form was then designed for the rest of the organisation. The aim of the cascading of the programme organisation-wide was to supplement the envisaged change agency role of the leadership group and to ensure that everyone within the organisation was given a fair opportunity to acquire entrepreneurial skills and to be exposed to the practice of corporate venturing.

7.5 I&CE training programme content

A five-module training course was put in place to address specific areas/dimensions measured by the Innovation and Corporate Entrepreneurship Assessment Instrument. The following subsections illustrate the outcome of the assessment per dimension and discuss particular focal points of the training course lectures and assignments.

7.5.1 Management support for CE and innovation

This dimension addressed issues relating to the extent to which management supports and encourages idea generation, creativity and innovation among staff, especially in relation to the services and products that the DFI offers to its clients. This included issues of career development, value-adding new idea generations, calculated risk taking, rules bending, improved work methods, and the like. Table 7.1 summarises 'management support' training needs assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.1: Management support training intervention focal points

ICEAI Results	Targeted training focal points	Comments and recommendations
• All categories of staff, except management who were neutral, disagreed with positive statements on management support for I&CE. • Employees felt that the DFI *generally* encourages new ideas for the improvement of the organisation, and supports staff with their career development. • They were much less likely to see support as being targeted specifically towards innovative individuals and projects. • Project managers and specialist/professional staff were especially negative about the level of management support they received for corporate entrepreneurship at the DFI. • All groups agreed that employees working on projects are not free to make their own decisions. • All groups other than Unit and Exco managers also agreed that the DFI is not aware of or receptive to workers' ideas and suggestions	All five-module I&CE courses targeting the leadership group: • Module 1-Creativity, innovation and opportunity finding • Module 2-Corporate Venturing: Creating new businesses within the firm • Module 3- Entrepreneurial Human Resource Management • Module 4-Entrepreneurial Marketing. • Module 5-Entrepreneurial financial management. Specific focus on: • Corporate entrepreneurial management • Intrapreneurship • Innovation • Corporate venturing - Venturing process model • Developing the venture business plan. • Fitting corporate entrepreneurship into strategic management. • The conceptual model of entrepreneurship as firm behaviour	• Emphasis was laid on building the capacity of management to provide support for innovation and entrepreneurship. • A significant number of the leadership (80%) group underwent targeted entrepreneurship training. • The overall training involved building a foundation for management entrepreneurial thinking and acting; support; encouragement; and change agency role.

7.5.2 Work discretion

This dimension measured the employees' freedom and autonomy in their jobs, opportunity to use own abilities, being their own boss, freedom to follow unconventional methods of doing their own work, independent judgment and decision-making and latitude for making mistakes without fear of being punished. Table 7.2 summarises 'work discretion' training needs assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.2: Work discretion training intervention focal points

ICEAI Results	Targeted training focal points	Comments and recommendations
• With the exception of project managers, employees were positive about work discretion they have at the DFI. • Unit and Exco managers have most discretion at work, with a large degree of autonomy and freedom. • The project manager group feels that they have less autonomy at work or that they are not their own bosses. • Both project managers and Unit/Exco managers felt that they would be subject to criticism and punishment if they made a mistake on the job.	• Management of innovation • Opportunity environment • Organisational culture characteristics. • Management styles(16) • Processes for sustaining a healthy business-building programme. • Entrepreneurial initiatives that do not always work • Managing disappointment • Managing failure/how to handle failure. • Reactions to success or failure	• Executive direction has promoted and encouraged staff to take responsible risk taking. • The Chief Executive and Managing Director of the DFI has personally assured staff that he will take failure of any entrepreneurial effort by staff member as a learning step provided it is done responsibly. • Reactions to success and failure are dependent on the organisational culture.

7.5.3 Employee rewards/reinforcements

This dimension sought to assess positive work challenges, job responsibility, work performance and recognition, and targeted rewards that promote or hinder corporate entrepreneurship and innovation. Table 7.3 summarises 'employee

rewards/reinforcements' training needs assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.3: Employee rewards/reinforcements training intervention focal points

ICEAI Results	Targeted training focal points	Comments and recommendations
• All employee groups felt that their jobs presented a lot of positive challenges. • They believed that their responsibilities would be increased if they performed well at work. • Only Unit and Exco managers felt that rewards were dependent upon performance. • Only managers were likely to think that managers would tell their bosses if an employee performed well! • Respondents were even less positive about reward specifically for innovation; Most did not feel that innovation was currently being awarded within the DFI. • The most frequently mentioned award for entrepreneurship and corporate innovation involved some kind of monetary benefit in the form of a salary increase, a bonus, royalties, or a profit share. • Employees were more interested in public recognition and acknowledgement for their work than financial gain.	• Entrepreneurial Human Resource Management o Traditional and conventional performance management practices o How to give incentives to employees to be entrepreneurial • Entrepreneurial compensation and rewards: o Focus on long-term performance with incentives for group efforts o Significant financial rewards for new venture o Emphasises responsibility. o Merit and incentive based management practices	• The DFI's Integrated Reward and Recognition Framework (IRR) with its related bonus scheme are suited for incremental entrepreneurial initiatives at individual and team level. • Innovative ways of giving recognition to entrepreneurial individuals and teams within the DFI need to be explored. • A combination of incentives and recognition should be explored for promoting both incremental and radical entrepreneurship, from idea generation to corporate venturing. • Chief Executive Awards have made provision for awarding innovation. • I&CE fund set aside for start-ups should include awards for the best ventures.

7.5.4 Time availability

This dimension assessed time availability for staff to perform their functions, including those related to idea generation, innovation and entrepreneurship. This area also looked at workload and long-term problem solving. Table 7.4 summarises 'time availability' training needs assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.4: Time availability training intervention focal points

ICEAI Results	Targeted training focal points	Comments and recommendation
• Employees agreed that there was hardly enough time to perform their standard job functions. • No time to come up with innovative ideas and putting these into action.	• Innovation management. • Time for I&CE training	• The DFI might learn from other organisations that have put a day per week or month aside for innovation

7.5.5 Organisational boundaries, barriers and bureaucracies

This dimension assessed the level of expectation and agreement on employees' work performance and Balance Score Card measures, level of trust in the performance management system, rigidity of the system and the change management role of management. It also examined the level at which policies, procedures, rules and workload promoted or hindered entrepreneurship and innovation within the DFI. Table 7.5 summarises 'organisational boundaries' training needs assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.5: Organisational boundaries training intervention focal points

ICEAI Results	Targeted training focal points	Comments and recommendations
• Employees knew what level of work experience was expected of them. • Most stated that their managers kept to these parameters when evaluating their job performance • Employees stated that they had to follow a large range of standard operating procedures as part of their major tasks at the DBSA. • Non-managerial/professional staff did not see scope for themselves to be innovative within their current job description and scorecard. • The project managers stated that they had many rules and regulations to follow on a daily basis. • They also stated that there were obstacles and roadblocks within the DFI that they could not overcome without managerial assistance. • Project managers felt that bureaucracy was standing in the way of innovation and corporate entrepreneurship at the DFI	• Creative environment • Creativity, innovation and opportunity finding • Creativity, innovation and opportunity; theory-knowledge base • Creative environment barriers: o Social o Economic o Physical o Cultural o Perpetual • Variables influencing intrapreneurship • Management of Innovation • Internal politics of venturing • Using political approaches to solve political problems. • The conceptual model of entrepreneurship as firm behaviour	▪ The DFI has entrenched strong and set ways of doing things based on its historical precedents e.g. business development approaches and the way projects and programmes are appraised. ▪ There is a need to increase entrepreneurial behavioural traits within the organisation whilst diminishing barriers to the creation of new ideas. ▪ Addressing barriers and promoting I&CE stand to unleash creative potential of the DFI staff.

7.5.6 Successful technology enablement

This dimension measured the extent to which the experimental DFI uses technology to enable innovation and entrepreneurship. This relates to the use of the intranet and/or internet to maximise and promote entrepreneurship, and the exploration of the existence of any programme that facilitates the flow and capturing of new ideas. Table 7.6 summarises 'technology enablement' training needs assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.6: Technology enablement training intervention focal points

ICEAI Results	Targeted training focal points	Comments and recommendations
• Employees are sceptical about technology enablement at the DFI. • Some were uninformed about the state of technology enablement within the DFI, and thus were not able to rate any of the elements for this.	• The design and delivery of the training intervention acknowledged efforts under way in this regard and therefore did not focus on technology enablement	• The Innovation portal was launched at the same time as the I&CE 1st diagnosis was conducted. • Staff were not familiar with the use of the portal at the time. • The efficient management of the portal and deployment of the portal administrator took time to be effected within the DFI.

7.5.7 The innovation process and portfolio management

This dimension assessed whether the organisation had a portfolio approach to managing innovation and sought to find out if staff understood the concepts of incremental and radical innovations. It also sought to find out if staff were familiar with the process of screening ideas and resource allocation within the experimental DFI, and whether there was any formalised or structured manner in which ideas were gathered, sorted, responded to, and developed. Table 7.7 summarises 'Innovation process and portfolio management' training needs

assessment results, the training intervention focal areas, and comments and recommendations.

Table 7.7: Innovation process and portfolio management training focal points

ICEAI Results	Targeted training focal points	Comments and recommendations
• Staff did not feel sufficiently informed to rate the questions relating to the innovation process. • Some were doubtful about the very existence of such a process.	• Corporate entrepreneurship process model: o Setting the scene o Identifying ventures o Planning, organising and starting the venture o Monitoring and controlling the venture o Championing the venture • *The DFI business process management*	The innovation process unfolded as the DFI business process management evolved, particularly when this process included idea generation and corporate entrepreneurship.
• Staff were in agreement about the fact that an innovation portfolio management approach did not currently exist at the DFI.	• Locating the venture in the organisation • Innovation portfolio to include and balance both radical and incremental innovations	There is no I&CE portfolio of innovations currently. It was suggested that such a portfolio should be managed centrally by the Corporate Strategy unit.

7.6 Corporate venturing

Corporate venturing involves the starting of new businesses within established organisations, usually emanating from an existing core competency, process or business model (Thornberry, 2003). For example, a development finance institution which has development risk analysis and pricing as its core competencies, can turn such competencies into a separate business and offer development risk management services to private sector companies which are increasing their involvement in development finance.

7.6.1 Identification of corporate ventures

Nineteen new corporate venture proposals were identified as part of the outcomes of the five training modules conducted for the leadership group. In addition to this, two other ideas were posted on the innovation portal. Therefore 21 new ventures were discussed and refined at the plenary session of the members of the leadership group. These 21 new ventures could be further categorised into 6 venture plans and 15 ideas. Of these, three have been accepted for recommendation for funding by executive management (Exco) of the experimental DFI. The process followed to screen and evaluate the proposals was as follows:

7.6.2 New venture evaluation panel: Roles and functions

A New Venture Evaluation Committee (NVEC) was established and consisted of leadership representation from each division and an external expert. It is anticipated that the NVEC will, over time, evolve into a permanent committee with full decision-making powers. Its purpose is to screen the new ideas and venture plans identified in the organisation, allocate the necessary resources within its delegated authority for further development of the plans, and recommend accepted venture plans to the Exco for final approval and funding.

It is further hoped that the NVEC will fill a change management role by dealing with cultural barriers to entrepreneurship and innovation and fostering entrepreneurial thinking and acting.

7.6.3 Screening the new venture plans: Screening criteria

The experimental DFI introduced standard screening criteria for new ideas and venture plans. These criteria were extensively discussed and tested during the screening of submitted venture plans; they are:

Strategic Fit: This facilitates the assessment of whether the venture is in line with the DFI's strategic objectives and would add value to the customer or

organisation. It highlights the need to assess whether the venture requires strategic partnerships.

Market position and sustainability: The market position criterion measures: the status of the current and anticipated competition or substitutes; and the current or potential size of the market. The sustainability criterion measures the venture's sustainability in terms of affordability and barriers to entry.

Required resources: Resources include both financial and human resources.

- *Financial performance requirements*: This includes issues such as projected cost of preparation, start-up capital and life-cycle costs, and projected revenues and cash-flows.

- *Human capital:* Human capital performance requirements involve questions of how the venture will be run and managed, and readiness of processes and systems to roll out the execution of the venture plan. This criterion further looks at whether the new venture will require new capabilities or substantial alterations in current capacities and skills. An assessment of whether or not the venture requires outside partners/resources for its execution is undertaken.

Time horizon: Time required for the venture preparation needs to be stated in each plan. This means time from start (design) to end (launch), including the key milestones of the project planning life cycle.

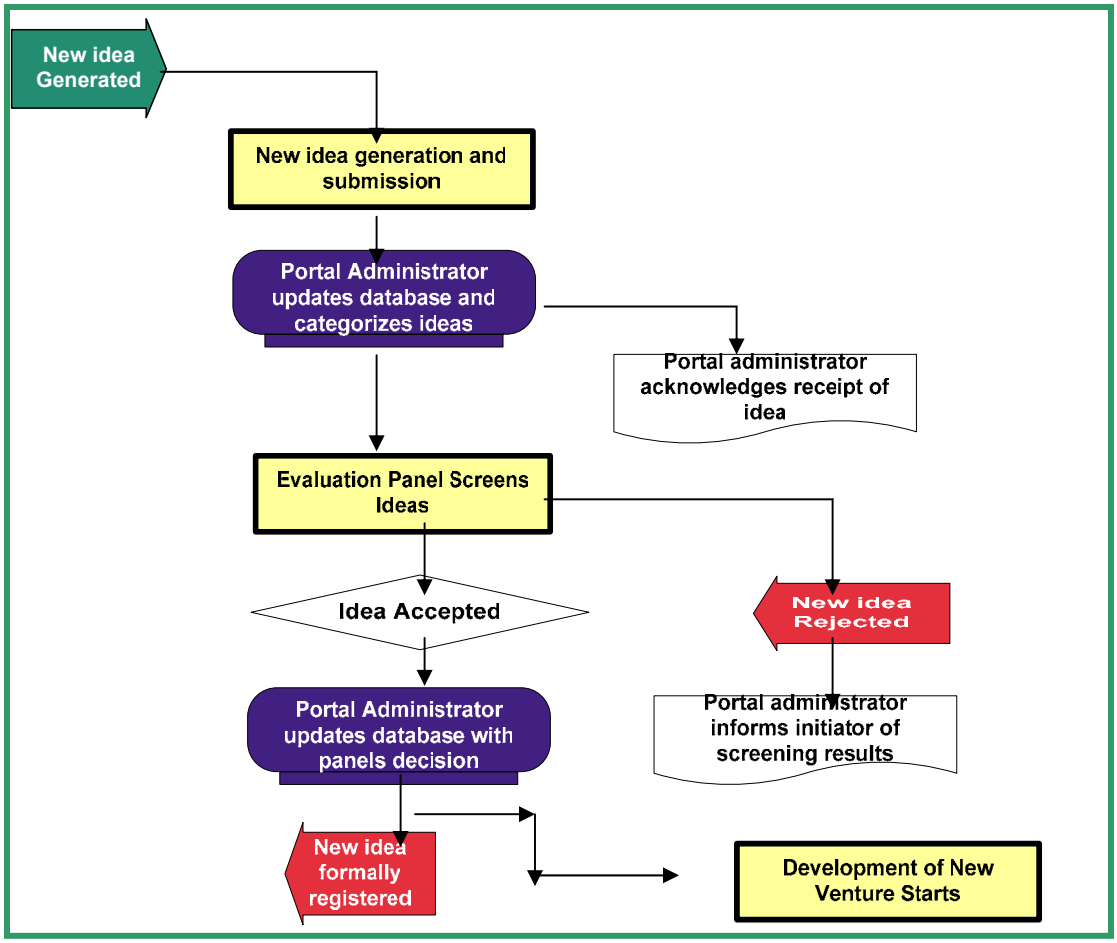
Newness and originality: The novelty of the idea is a key consideration. The panel looks at originality, uniqueness, newness and level of creativity of the proposed venture.

Potential risk: This relates to the probability and impact of the risk on the financial performance, credit rating, reputation and development impact.

7.7 Entrepreneurship and innovation process

It became essential to lay out a comprehensive process flow, from idea generation to new venture implementation. The process flow serves as a guide to inform staff on where to take their creative ideas and how these will be treated at different stages of the innovation process. It provides a description of approval points and clarifies the roles and functions of different role-players such as the portal administrator, the venture evaluation panel and executive management. This was posted onto the experimental DFI's innovation portal at the start of the business planning phase (Feb 2006) of the corporate venturing component of the training intervention. Figure 7.3 depicts a process flow for the venturing process.

Figure 7.3: Venturing process flow



Source: Adapted from the BPM's output on innovation and corporate entrepreneurship: Process Steward, H. Moatshe

7.8 Communication and promotion of the ventures

7.8.1 The innovation portal

The innovation portal was put in place and launched in May 2005. Staff members posted their innovative ideas on the portal. It became clear, however, that for better efficiency of the portal and for a speedy response to the ideas generated, further systems and processes needed to be developed and implemented. To this effect a portal administrator was appointed and the portal's development continues to evolve and to improve in efficiency and effectiveness.

7.8.2 Awareness raising

As part of the integration of the change management interventions, innovative ways of raising awareness around entrepreneurship and innovation were implemented. This entailed the use of animated email messaging and closed-circuit broadcast screens (plasma screens hanging from the ceiling, instead of paper posters), creating platforms where staff could table ideas and introducing competitions to encourage teamwork in innovation. In order to maintain the momentum of infusing an entrepreneurial culture in the experimental DFI, national and international entrepreneurs and innovators were invited to participate in strategic conversations and dialogues.

7.9 Participants' evaluation feedback reports

In addition to responses to the open-ended questions in the first diagnostic survey, diverse feedback was obtained from the training intervention and Management Review Meetings. These evaluations identified the following factors that promote and enhance or detract from entrepreneurship and innovation within the DBSA. This feedback is classified under factors that have promoted entrepreneurship and innovation in the DBSA to date and those that have hindered it.

7.9.1 Factors that have promoted entrepreneurship and innovation

7.9.1.1 Executive management's exposure

The exposure of most senior executives to the discipline of entrepreneurship and value innovation has been a trigger for steering the experimental DFI towards entrepreneurial orientation. This has ensured that interventions introduced are championed from the top management level. It has also ensured that entrepreneurship and innovation remain a priority strategic consideration.

7.9.1.2 Strong leadership

The DFI leadership has consistently promoted entrepreneurial thinking and acting. The leadership has also committed resources (human, time and finance) to untried ideas and programmes. The leadership support for entrepreneurship has cultivated entrepreneurial thinking amongst staff and enhanced entrepreneurial behaviour.

7.9.1.3 Organisational values

Redefining the experimental DFI values and the visible commitment to those values by the leadership group ensured a solid foundation for the embedding of innovation and entrepreneurship in the organisational culture. The signing of the leadership charter in front of the entire staff membership of the organisation committed the leadership group to espouse entrepreneurial values such as responsible risk taking and decision making.

7.9.1.4 Knowledge management orientation

The experimental DFI has in place a knowledge management strategy which sets out a vision and processes for maximising organisational learning. This creates a climate conducive to: ideation, creativity, innovation, and the introduction of new ventures; and shared learning.

The training intervention and venturing exercises have enabled the experimental DFI to systematically collect information from practical experience. The learning involves knowledge collection, accounting, sharing, and application. All this bodes well for the fostering of an entrepreneurial learning culture within the organisation.

7.9.2 Factors that hinder corporate entrepreneurship

7.9.2.1 Attitudes towards innovation and corporate entrepreneurship

The attitude of some staff towards the innovation and corporate entrepreneurship training intervention was sceptical. Staff perceived the introduction of corporate entrepreneurship in the organisation as another 'fad' that was likely to fade away as it became replaced by other incoming initiatives.

7.9.2.2 Performance contracting

The perception that performance contracting in the DFI is inflexible renders the introduction of new initiatives after the signing of performance contracts difficult. This leads to staff not giving new initiatives priority, as such initiatives are unlikely to impact on their performance incentives.

7.9.2.3 The nature of work

It has also been identified that the diminution in numbers of staff attending training over time was due to the nature of their work, which required extensive travelling for business purposes. This factor has implications for how management responds and makes 'time available' for corporate entrepreneurship in the organisation.

7.10 Proposition testing

Twenty one new ventures were proposed, and business plans for six of them proved viable and were approved for funding by Exco.

Previously, the experimental DFI's Balance Score Card budgeted for three new products per annum. Only one on average would materialise (DBSA Annual Reports, 1996-2005). Therefore:

Proposition H_0D1: Rejected

There **is** a significant increase in the number of new ventures that are indicative of a corporate entrepreneurship culture.

7.11 Conclusions

This chapter shows that the corporate entrepreneurship training intervention was aligned with the results of the innovation and corporate entrepreneurship assessment.

The scientific measurement and verification of the impact the courses have had on successfully increasing the knowledge of entrepreneurship required by the leadership group to support staff in their innovative endeavours is the subject of Chapter 8:

However, concrete evidence in the form of viable business plans for new corporate ventures has emerged, demonstrating a practical increase in the leadership group's own corporate venturing capability. This group was targeted for innovation and corporate entrepreneurship training so that they could serve as change agents for the rest of the experimental DFI.

The regular administering of the ICEAI to identify both triggers for and barriers to entrepreneurship is necessary. This should lead to an in-depth qualitative exploration of ways and means to reinforce enhancers and minimise or eliminate barriers.

Chapter 8: Post-intervention CE assessment (O_2): Comparisons between pre-, post- and control groups (O_1, O_2, O_3)

8.1 Introduction

This chapter presents statistical comparisons of employee opinions about innovation and corporate entrepreneurship between: the experimental DFI pre-intervention survey results (O_1), the experimental DFI post-intervention survey results (O_2), and the control group of DFI's survey results (O_3). The analysis seeks to prove the research hypothesis based on the research question of "how successful can corporate entrepreneurship training be in DFIs?" In other words, the intention is to test the proposition that:

> There **is not** a significant difference between the corporate entrepreneurship opinions of the study observation groups (pre-, post and control groups) regarding the Corporate Entrepreneurship constructs.

The format in which the results of the analysis are presented is as follows:

- An ANOVA is conducted between the opinions of the three observation groups, i.e. the pre-intervention, the post-intervention and the control groups. This is to test the proposition that there **is not a** significant difference between the innovation and corporate entrepreneurship opinions of the study observation groups *(pre-, post and control groups)* regarding the seven constructs in the questionnaire.

- An ANOVA is conducted between the opinions of two observation groups, i.e. the pre-intervention and the post-intervention groups. This is to test the proposition that there **is not** a significant change in the corporate entrepreneurship opinions of the employee stratification groups from the pre- to post-intervention groups regarding the seven constructs in the

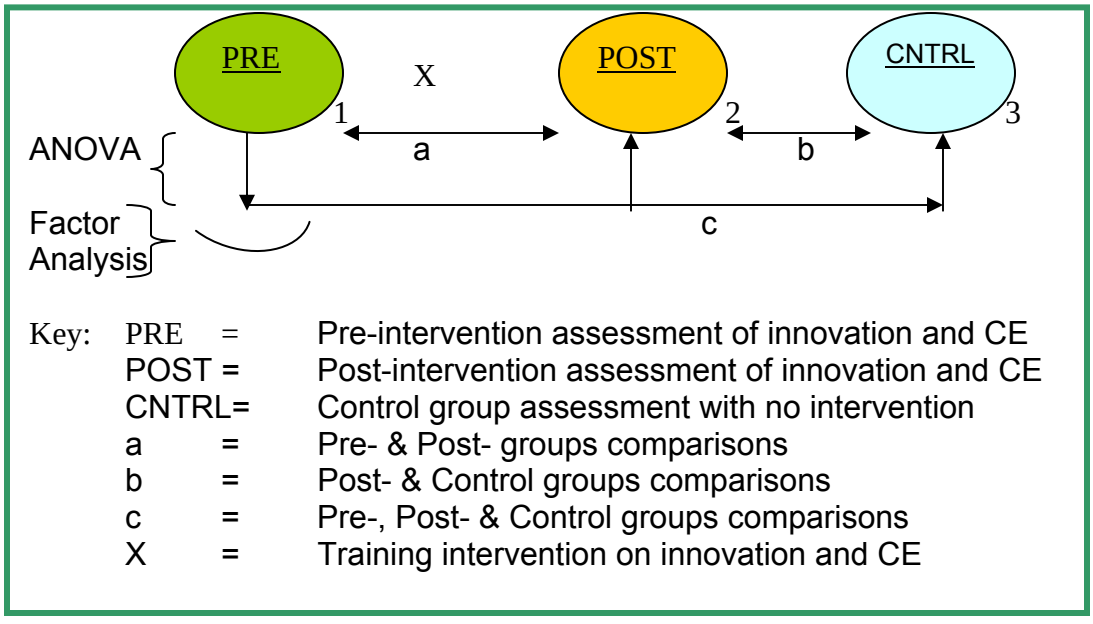
questionnaire. This will indicate the extent of the effectiveness of the training intervention described in Chapter 7, per the various employee categories.

Observations and comments are made on ANOVA results between the post-intervention and the control group results, as these reflect the scope for further training interventions needed at the experimental DFI or its superiority as a result of innovation and CE intervention;

Where the ANOVA displays significant differences, and to compensate for the fact that an ANOVA does not indicate which individual mean or means are different from the consensus value and in what direction they deviate, the Scheffe's Test, a multiple comparison test, is carried out. The Scheffe's Test controls for type 1 error.

In order not to fall into an analysis paralysis trap, only the comparisons that result in statistically significant differences will be discussed in detail. However, recommendations will be based on all observations. Figure 8.1 below depicts the ANOVA comparisons diagrammatically.

Figure 8.1: Depiction of ANOVA comparisons



Source: Own compilation

Table 8.1 below summarises the seven constructs of the questionnaire used in observations 1, 2, and 3 to survey the views of pre-, post-, and control groups respectively. The table also shows propositions H0: C1-C7 tested in the indicated sections of the chapter.

Table 8.1: Summary of H_0: **C** propositions testing for sections 1 and 2

H_0	There is not a significant difference regarding…	Between **Post** and **Pre** Groups (ANOVA)	Between **Post** and **Control** Groups (ANOVA)	Between **Control** and **Pre** Groups (ANOVA)
H_0**C**1	Managerial support	H_0**C**1.**1**	H_0**C**1.**2**	H_0**C**1.**3**
H_0**C**2	Work discretion	H_0**C**2.**1**	H_0C2.**2**	H_0**C**2.**3**
H_0**C**3	Rewards / Reinforcements	H_0**C**3.**1**	H_0C3.**2**	H_0**C**3.**3**
H_0**C**4	Time availability	H_0**C**4.**1**	H_0C4.**2**	H_0**C**4.**3**
H_0**C**5	Organisational boundaries	H_0**C**5.**1**	H_0C5.**2**	H_0**C**5.**3**
H_0**C**6	Innovation org. support	H_0**C**6.**1**	H_0C6.**2**	H_0**C**6.**3**
H_0**C**7	Innovation portfolio management	H_0**C**7.**1**	H_0C7.**2**	H_0**C**7.**3**
Key: **C** = proposition (H_0) that there is not a significant difference between **pre**-, **post**- and c**ontrol** groups, regarding the innovation and CE constructs.				

8.2 Proposition testing: Comparisons between *all* study observation groups

Table 8.2.1 presents the results of an analysis of the three observation groups' data sets for all constructs at the same time. Table 8.2.2 presents further analysis to determine the direction of the difference, mainly between the pre-intervention and the post-intervention groups.

Table 8.2.1: ANOVA: Between ***all*** observation groups regarding constructs

Proposition	Construct	Observation Group	N	Mean	Standard Deviation	F Values	P-Value
H_0C1	Management support	Pre	312	2.645	0.694	11.46	<.0001*
		Post	206	2.823	0.717		
		Control	101	3.008	0.659		
H_0C2	Work discretion	Pre	312	3.134	0.763	5.16	0.0060*
		Post	206	3.311	0.772		
		Control	101	3.358	0.677		
H_0C3	Rewards / Reinforcements	Pre	312	3.068	0.782	5.75	0.0034*
		Post	206	3.212	0.785		
		Control	101	3.355	0.767		
H_0C4	Time availability	Pre	312	2.553	0.814	1.09	0.3376
		Post	206	2.449	0.860		
		Control	101	2.467	0.855		
H_0C5	Organisational boundaries	Pre	312	2.858	0.852	2.49	0.0836
		Post	206	2.935	0.834		
		Control	101	2.706	0.841		
H_0C6	Innovation org. support	Pre	312	2.644	0.770	8.53	0.0002*
		Post	206	2.933	0.755		
		Control	101	2.760	0.838		
H_0C7	Innovation portfolio mngmt.	Pre	312	2.500	0.839	9.89	<.0001*
		Post	206	2.817	0.787		
		Control	101	2.512	0.868		
* = statistical significance; α = 0.05;							

Applying the p-value Rejection Rule that one should 'reject the null hypothesis if, and only if, the p-value is less than α', based on α=0.05, the following is found:

- That there are **not** significant differences between the pre-, post-, and control groups' corporate entrepreneurship opinions about ***Time availability*** (**H_0C4)** and ***Organisational boundaries*** (**H_0C5).** It can therefore be concluded without further analysis that the training intervention has not succeeded in influencing opinions on these two constructs, and that more training is recommended.

- That there **are** significant differences between the pre-, post-, and control groups' corporate entrepreneurship opinions about ***Management support for CE*** **(H_0C1)**, ***Work discretion*** **(H_0C2)**, ***Rewards/reinforcements*** **(H_0C3)**,

Innovation organisational support **(H_0C3)**, and ***Innovation portfolio management*** **(H_0C3)** constructs.

Table 8.2.2 presents Scheffe's Test results to determine which groups are statistically different and to indicate the direction of the difference.

Table 8.2.2: Scheffe's Test: Pre-, post- and control groups regarding constructs

Proposition	Construct	Means (of observation groups)			Significance test		
		Pre-	Post-	Control	Post- vs. Pre-	Post- vs. Control	Pre- vs. Control
$H_0C1.1$ $H_0C1.2$ $H_0C1.3$	Mangmt support	2.64	2.82	3.00	**+*** Po > Pr**	**-*** Po < Co**	**-*** Pr < Co**
$H_0C2.1$ $H_0C2.2$ $H_0C2.3$	Work discretion	3.13	3.31	3.35	**+*** Po > Pr**	**-*** Po < Co**	**-*** Pr < Co**
$H_0C3.1$ $H_0C3.2$ $H_0C3.3$	Rewards / Reinforc.	3.06	3.21	3.35			**-*** Pr < Co**
H_0C4	Time availability	2.55	2.44	2.46			
H_0C5	Organis. boundaries	2.85	2.93	2.70			
$H_0C6.1$ $H_0C6.2$ $H_0C6.3$	Innovation org. support	2.64	2.93	2.76	**+*** Po > Pr**		
$H_0C7.1$ $H_0C7.2$ $H_0C7.3$	Innovation portfolio mngmt.	2.50	2.81	2.51	**+*** Po > Pr**	**+*** Po > Co**	**-*** Pr < Co**

***indicates a statistically significant difference at α = 0.05 level; **Po** = Post group; **Pr** = Pre group; **Co** = Control group.

Based on the results in Table 8.2.2, the following is found:

- There **is** a statistically significant improvement in the corporate entrepreneurship opinions of the experimental DFI employees from pre- to post-intervention groups regarding: *Management support for CE* **(H_0C1.1)**; *Work discretion* **(H_0C2.1)**; *Innovation organisational support* **(H_0C6.1)**; *Innovation portfolio management* **(H_0C7.1).** This means that the training intervention was successful in changing the opinions of employees on these constructs for innovation and corporate entrepreneurship.

- Despite the improvement, the post- group opinions are still statistically significantly below those of their counterparts in other DFIs (control group). This is an indication that, even though there is an improvement at the experimental DFI, the training intervention should be maintained in order to raise innovation and CE awareness to an international standard.

- In all the other constructs, there was no statistically significant change from pre- to post- groups.

In summary, the results in Table 8.2.2 indicate that:

- A statistically significant improvement occurred from the pre-intervention to post-intervention state of employee attitudes to innovation and corporate entrepreneurship at the experimental DFI in all but three constructs.

- Two of the constructs that do not show a statistically significant difference: 'rewards/reinforcements' and 'organisational boundaries', nevertheless show an improvement, albeit not a statistically significant one, with the 'rewards/reinforcements' construct also showing an above-average mean.

- Where the intervention **has not** been statistically successful, opinions on innovation and corporate entrepreneurship are below average, and innovation and CE opinion levels are at similar levels in all tested DFIs. Alternative

intervention mechanisms are recommended for future research and implementation.

Where there **has been** a statistically significant difference (improvement) from pre- to post-intervention groups per construct, further analysis is conducted below to determine which employee categories contributed most, or did not contribute, to the improvement. Conversely, the analysis will show areas of focus in other (non-experimental) DFIs for them to be able to improve their innovation and corporate entrepreneurship climate. This will also highlight remaining areas of focus for improving or sustaining similar interventions in DFIs.

Therefore, the tables below examine the source of the difference per independent variable (employee category) for those constructs that show significant differences, i.e. Management support, Work discretion, Innovation organisational support, and Innovation portfolio management.

Table 8.2.3: ANOVA: Observation groups; 'Management support'; and employee categories

Proposition	Construct Name	Sub-proposition	Employee Category	Degrees of Freedom (D.F)	Mean Square (MS)	*F* Values	*P*-Value
H_0C8	Management support	**H_0C8.1**	Job category	3	0.4070	0.94	0.4214
		H_0C8.2	Gender	3	0.0793	0.18	0.9078
		H_0C8.3	Age	9	0.7489	1.73	0.0798
		H_0C8.4	Experience	12	1.1287	2.60	0.0022*
		H_0C8.5	Education	8	1.6911	3.90	0.0002*

Comparing mean scores on 'Management support' by the three observation groups and per employee category, the following is found:

Proposition H_0C8.1: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of managers and non-managers of the experimental DFI from pre- to post-intervention groups regarding *Management support for CE*.

Proposition H_0C8.2: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of males and females of the experimental DFI from pre- to post-intervention groups regarding *Management support for CE*

Proposition H_0C8.3: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of the various age categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Management support for CE.*

Proposition H_0C8.4: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various *experience* categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Management support for CE.*

- All employee **experience** categories improved from pre- to post-intervention except those who had been with the experimental DFI for 5-9 years. 'Newer' (0-5 years) and the 'very experienced' (10-20 and above) employees are therefore amenable to entrepreneurial training. Opinions of DFI employees with 5-10 years' experience regressed between pre- and post observations, and further research is recommended to find the reasons.

Proposition H_0C8.5: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various education level categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Management support for CE.*

- All employee **education** categories improved from pre- to post-intervention. The statistically significant improvement proves that the intervention has worked even to the education levels that had the least average opinion on this construct. However, there may still be significant differences among

employee education categories of the same organisation regarding management support for CE in DFIs;

Table 8.2.4: ANOVA: Observation groups; 'Work discretion'; and employee categories

Proposition	Construct Name	Sub-proposition	Employee Category	Degrees of Freedom (D.F)	Mean Square (MS)	*F* Values	*P*-Value
H_0C9	Work discretion	**$H_0C9.1$**	Job category	3	0.7455	1.36	0.2558
		$H_0C9.2$	Gender	3	1.5502	2.82	0.0385
		$H_0C9.3$	Age	9	0.2539	0.46	0.9002
		$H_0C9.4$	Experience	12	1.2014	2.18	0.0114
		$H_0C9.5$	Education	8	0.8327	1.51	0.1494

Comparing mean opinions on 'Work discretion' by the three observation groups and per employee categories, the following is found:

Proposition $H_0C9.1$: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of managers and non-managers of the experimental DFI from pre- to post-intervention groups regarding *Work discretion*.

Proposition $H_0C9.2$: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of males and females of the experimental DFI from pre- to post-intervention groups regarding *Work discretion.*

- Both employee **gender** categories improved from pre- to post-intervention. Both males and females have an above average view of CE in all experiment DFIs. Therefore, gender does not seem to be a differentiating factor in changing employee opinions about CE supportive work discretion in DFIs;

Proposition H_0C9.3: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of the various age categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Work discretion.*

Proposition H_0C9.4: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various *experience* categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Work discretion.*

- All employee **experience** categories have an overall above-average view of the work discretion dimension of CE. However, 'newer' (0-5 years) and the 'very experienced' (15-20 years and above) employee experience categories improved from pre- to post-intervention. Opinions of DFI employees with 5-14 years experience regressed between pre- and post- observations, and further research is recommended to find the reasons.

Proposition H_0C8.5: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of the various education level categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Work discretion.*

Table 8.2.5: ANOVA: Observation groups; 'Innovation Organisational Support'; and employee categories

Proposition	Construct Name	Sub-proposition	Employee Category	Degrees of Freedom (D.F)	Mean Square (MS)	*F* Values	*P*-Value
H_0C13	Innovation Org. Support	**H_0C13.1**	Job category	3	0.3618	0.67	0.5734
		H_0C13.2	Gender	3	0.1072	0.20	0.8982
		H_0C13.3	Age	9	0.3547	0.65	0.7517
		H_0C13.4	Experience	12	1.0503	1.93	0.0285
		H_0C13.5	Education	8	2.3949	4.41	<.0001

Comparing mean opinions on 'Innovation organisation support' by the three observation groups and per employee categories, the following is found:

Proposition H_0C13.1: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of managers and non-managers of the experimental DFI from pre- to post-intervention groups regarding *Innovation organisational support*.

Proposition H_0C13.2: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of males and females of the experimental DFI from pre- to post-intervention groups regarding *Innovation organisational support.*

Proposition H_0C13.3: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of the various age categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Innovation organisational support.*

Proposition H_0C13.4: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various *experience* categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Innovation organisational support.*

- All employee **experience** categories improved from pre- to post-intervention. Therefore, employee levels of experience do not seem to be a differentiating factor in changing employee opinions about organisational support (systems and processes) for innovation in DFIs.

Proposition H_0C13.5: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various education level categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Innovation organisational support.*

- All employee **education** categories improved from pre- to post-intervention. The statistically significant improvement proves that the intervention has worked even to the education levels that had the least average opinion on this construct. However there may still be significant differences among employee education categories of the same organisation regarding organisational support (systems and processes) for innovations in DFIs;

Table 8.2.6: ANOVA: Observation groups; 'Innovation portfolio management'; and employee categories

Proposition	Construct Name	Sub-proposition	Employee Category	Degrees of Freedom (D.F)	Mean Square (MS)	*F* Values	*P*-Value
H_0C14	Innovation Portfolio Management	**H_0C14.1**	Job category	3	0.3698	0.59	0.6242
		H_0C14.2	Gender	3	0.2545	0.56	0.6402
		H_0C14.3	Age	9	0.3796	0.60	0.7958
		H_0C14.4	Experience	12	1.3442	2.13	0.0138
		H_0C14.5	Education	8	1.9720	3.13	0.0018

Comparing mean opinions on 'Innovation portfolio management' by the three observation groups:

Proposition H_0C14.1: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of managers and non-managers of the experimental DFI from pre- to post-intervention groups regarding *Innovation portfolio management*.

Proposition H_0C14.2: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of males and females of the experimental DFI from pre- to post-intervention groups regarding *Innovation portfolio management.*

Proposition H_0C14.3: Accepted

There **is not** a significant change in the corporate entrepreneurship opinions of the various age categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Innovation portfolio management.*

Proposition H_0C14.4: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various *experience* categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Innovation portfolio management.*

- All employee **experience** categories improved from pre- to post-intervention. Therefore employee levels of experience do not seem to be a differentiating factor in changing employee opinions about Innovation portfolio management in DFIs.

Proposition H_0C14.5: Rejected

There **is** a significant change in the corporate entrepreneurship opinions of the various education level categories of employees of the experimental DFI from pre- to post-intervention groups regarding *Innovation portfolio management.*

- All employee **education** categories at holders of a degree and above improved from pre- to post-intervention. Employee **education** categories below holders of a degree regressed from pre- to post-intervention. 'Innovation portfolio management' is a sophisticated function and is a top management responsibility. Lack of understanding by the lower-educated

employees is therefore not surprising. No further action to rectify this is recommended.

8.3 Conclusion

Findings outlined in this chapter are summarised in Chapter 9, which deals with findings, recommendations and future research. It should, however, be noted that no analysis was done of the least squares means to test for interaction effect between employee categories and observation groups (DFIs). The datasets allow for such further studies, which are recommended.