CHAPTER III

RESEARCH METHODOLOGY

This chapter describes the methodology adopted for this study. It begins by discussing the research design. Then it goes on to discuss in some detail the research instrument, the sampling and data collection procedures and the selection of measurement scales. The chapter concludes with a description of the statistical techniques used to analyse the data collected.

3.1 RESEARCH DESIGN

As this is an exploratory study, the ex-post facto research design was adopted, as this is the most appropriate design for such study. In this design, no attempt is made to manipulate the independent variables - in this study, the demographic data of consulting engineers.

3.2 RESEARCH INSTRUMENT

This study uses the mailed questionnaire to collect primary data. The mailed questionnaire is used as a survey instrument because it is probably the best method for examining and describing large populations in a study subject to time and budget constraints. The questionnaire used in this study was developed by other researchers and thus it is assumed to have high reliability and high validity content. The actual reliability and validity content are not known. The questionnaire consists of three parts from which various variables were extracted for statistical analysis. The variables comprise :-
(i) the motivational needs of consulting engineers;
(ii) the motivational demands of organisational tasks; and
(iii) demographic data.

The measurement scales used in this study were adopted from foreign studies. However, to suit research objectives and local conditions, the scales were slightly modified.

3.3 SAMPLING AND DATA COLLECTION PROCEDURES

This study was confined to consulting engineers working in engineering consulting firms located in the Klang Valley. It was so confined because the highest concentration of such firms is to be found there. Due to the usual time and money constraints, the study excluded consulting engineers working in other firms. Also excluded for the same reasons were consulting engineers working in the public sector. Thus, the sampling frame can be defined as consisting of those consulting engineers working in engineering consulting firms which are located in the Klang Valley and which are registered with either the ACEM or the BEM. As some engineering consulting firms are registered both with the ACEM and the BEM, appropriate steps were taken to avoid double counting.

The sampling design, i.e. is the type of method or approach used to select the units of analysis for the study, was simple random sampling. This is a probability design type and was chosen because it produces good generalisability of results, universal acceptance and is relatively accurate. The following procedure was adopted to collect primary data :-

(i) survey questionnaires were sent to selected engineering consulting firms in the sampling frame;
(ii) the survey questionnaires were then distributed randomly to the consulting engineers working in those firms; and

(iii) the consulting engineers were requested to return the completed questionnaires to a designated address using the stamped envelopes provided for the purpose.

To enable generalisability of the research results, the number of questionnaires sent to each firms varied from a minimum of two sets per firm (for small firms) to a maximum of twenty sets per firm (in the case of large firms). A total of 200 sets of questionnaires were distributed, of which 175 sets were returned by 31st December 1994.

3.4 MEASUREMENT SCALES

In this study, six constructs were measured:-

(i) need for achievement;

(ii) need for power;

(iii) need for affiliation;

(iv) achievement task;

(v) power task; and

(vi) affiliation task.

The measurement scales for the constructs were taken from previous studies. These scales were selected as they met the requirements of this study and because they had proven reliable in earlier studies (Litwin 1968). The first three constructs measure the motivational needs of the respondent with respect to McClelland's 3 Needs Theory; these three constructs constituted Part A of the survey questionnaire. The last three constructs measure the motivational demands of the respondent's organisational tasks and constituted Part B of the survey questionnaire. The six constructs are briefly discussed below.
3.4.1 Motivational Needs Constructs

The first three constructs measure the levels of the need for achievement, the need for power and the need for affiliation, respectively. In each of these constructs, there are four items concerning the motivated work behaviour related to the respective needs. In the original questionnaire (Litwin 1968), the respondents were asked to answer either "Yes" or "No" to each of the items. If the respondent answered "Yes" to all the four items with respect to a particular need, the motivational need in question was considered to be strong. However, in this study, the scale for each item was modified to a 5 point Likert-type response, as follows:-

1 = never
2 = infrequently
3 = sometimes
4 = frequently
5 = always

Thus, the respondents were requested to circle the "number" (1 to 5) that best reflected their work behaviour. As such, the level of each separate need can actually be measured. The minimum score possible for each need is 4 while the maximum is 20. Furthermore, with this scale, a conclusion as to which is the predominant need of the respondents can be arrived at simply by comparing the scores for the three constructs.

3.4.2 Organisational Task Constructs

The last three constructs measure the motivational demands of the respondent’s organisational task. They actually constitute a task analysis, designed to analyse if an organisational task is an achievement task, a power task or an affiliation task. This task analysis was developed by Turner and Lawrence (1965). For each type of task, there are five items to be answered by the respondent. The scale for each item is a 3 point
Likert-type response, as follows:

1 = low
2 = moderate
3 = high

Respondents were requested to circle the "number" (1 to 3) that best reflected their opinion of their current job task. The minimum score possible for each construct is 5 and the maximum is 15. According to Turner and Lawrence, total scores mean little here. It is the relative scores in each of the three constructs that measure the motivational demands of the task. Thus, for example, if a respondent scored 7 for achievement task, 7 for power task and 14 for affiliation task, this means that the job task is the one that seems to satisfy a person’s need for affiliation. To conclude, if that person has dominant affiliative needs, then there is an appropriate fit between his tasks and his motives.

3.5 STATISTICAL TECHNIQUES

The data collected was analysed using the Statistical Package for the Social Sciences (SPSS) programme. The data analysis procedures used in this study are described below.

3.5.1 Data Error Checking And Verification

The raw data had to be processed before analysis was possible. There were basically four stages in this process, as follows:

(i) data editing;
(ii) data coding;
(iii) data entry (keyboarding); and
(iv) data cleansing.
The first stage (data editing) involved giving clarity, readability, consistency and completeness to a set of collected data. Some of the issues tackled here were:

(i) would the collected data create conceptual and/or technical problems in the analysis?

(ii) would the collected data logically justify the interpretation of the results? and

(iii) was the data clear, consistent and complete for coding?

The second stage (data coding) involved translating the raw data into numerical codes for the purpose of transferal to a data storage medium and subsequent analysis. One of the issues tackled here was to check if the coding categories were consistent with the research design and the purpose of the study. After passing through the first two stages without any major/significant errors, the raw data in this study were entered into the computer using the DOS editor, thereby creating a working data file (the third stage). Finally, "data cleansing" (the fourth stage) was carried out to ensure that all codes were legitimate. For example, the "frequency" subprogramme of the SPSS was used to examine the data entered and to identify coded values that lay outside the permissible range of accepted answers. These "outliers" were considered "missing values" and were therefore excluded from subsequent statistical analysis.

3.5.2 Summary Statistics

The "frequency" subprogramme was also used to provide an overview of the respondents’ demographic backgrounds, such as the mean values and percentile values.

3.5.3 Reliability Test

All the six constructs (need for achievement, need for power, need for affiliation, achievement task, power task and affiliation task) were subjected to a test for reliability. Reliability refers to the consistency and stability of a score from a measurement scale. It was imperative to subject the constructs to a reliability test
because, if the measurement instrument is not reliable, it can in no way be valid. Thus, validity of results is not possible unless reliability is first demonstrated. For example, in this study, if reliability had not been assessed and the correlation between the scales of any two constructs turned out to be low, the researcher would have no way of knowing whether there was simply little relationship between the two constructs or whether the scales themselves were just unreliable.

In this study, the "internal consistency" method was used to assess the reliability of scales and Cronbach's alpha was calculated by the SPSS programme. Cronbach's alpha is the mean reliability coefficient for all the possible ways of splitting a set of items into half. Nunnaly's guidelines (Davis and Cosenza 1993) on the necessary value of alpha are as follows :-

<table>
<thead>
<tr>
<th>Usage</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>exploratory</td>
<td>0.5 - 0.6</td>
</tr>
<tr>
<td>basic</td>
<td>0.8</td>
</tr>
<tr>
<td>applied</td>
<td>&gt; 0.9</td>
</tr>
</tbody>
</table>

Nunnaly defines "applied research" as research where important decisions are to be made based on the specific test scores. For the present study, which is essentially "exploratory" in nature, a minimum value of alpha of 0.5 was adopted.

3.5.4 Multiple Regression Analysis

Multiple regression analysis is a statistical technique which is used to analyse the relationship between a single criterion (dependent) and several predictor (independent) variables. The result is a variate, i.e. a linear combination of the independent variable that best predicts the dependent variable. Furthermore, in building a regression model, a stepwise multiple regression can be used to help build the "best" regression model. Stepwise multiple regression examines the contributions
of each predictor variable to the regression model. Each predictor variable is considered for inclusion prior to developing the model equation, and only those predictor variables that are significant are included in the final model.

The present study investigates which of the demographic variables are significant predictors of the motivational needs of consulting engineers. Therefore, three multiple regression analyses were carried out with the need for achievement, the need for power and the need for affiliation as the criterion variables, and the demographic variables as the predictor variables.

3.5.5 Crosstabulation

Crosstabulation is a technique for analysing results by groups, categories or classes. Its purpose is to allow the inspection and comparison of differences among groups using percentages. The percentages are computed in the direction of the independent variables. Thus, the crosstables should be read across the dependent variables. In crosstabulation, Chi-square analysis is used to determine whether or not the observed association is statistically significant. The null hypothesis states that there is no difference in population proportions, whereas the alternative hypothesis states that there are differences in population proportions. In this study, it was assumed that, for significance, the alpha value must be less than 0.05. This was the probability of making a Type 1 error, i.e. the probability of rejecting the null hypothesis when the null hypothesis is true. The confidence level was therefore 95 percent. The observed significance value (also referred to as the observed P-value) calculated from the sample was then compared to the alpha value. If the observed significance value was less than the alpha value of 0.05, the null hypothesis would be rejected and the conclusion would be that the variables were related (and vice versa).
3.5.6 Comparative Analysis

Comparative analysis requires comparison of the pertinent population parameters for each population. Depending on the member of groups (populations) involved, two frequently used statistical techniques are as follows :-

(i) t-test ; and

(ii) ANOVA.

The t-test is used to test the hypothesis that the mean scores from two samples or groups (such as male and female) on some interval or ratio scaled variables significantly differ from each other. It assumes that the two groups are normally distributed and that their variance is equal (homoscedasticity). In interpreting printouts from the SPSS programme, if the observed significance level of the F statistic is small (less than 0.05), the separate-variance t-test for means is used. Otherwise, the pooled variance estimate is used.

The ANOVA (one-way analysis of variance) compares the means of samples from more than two populations or groups (such as ethnic groups) to determine whether or not any differences are statistically significant. The total variance observed is placed into two classes :-

(i) from within-group variations; and

(ii) from between-group variations.

The ratio of the variance between groups to the variance within the group gives the F-statistic. If the observed F-statistic value is greater than the test value at the 0.05 level of significance, it can then be concluded that there is a significant difference in the means of the sample groups. In this study, the t-test and ANOVA were used to assess the effect of their demographic backgrounds on the motivational needs of consulting engineers.