USE OF STATISTICAL MODELING AND PREDICTING THE EMPLOYEE SATISFACTION OF ACADEMICS IN SRI LANKA: A CASE STUDY

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Dissertation submitted in partial fulfillment of the requirements for the degree Master of Science in Operational Research

Department of Mathematics

University of Moratuwa
Sri Lanka

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DECLARATION

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Abstract

This study has mainly focused on statistical modelling in predicting employee satisfaction. Different regression techniques have been applied to examine the factors affecting employee satisfaction of the academics in Sri Lankan universities. Superior behavior, co-worker behavior, job itself, physical conditions, teaching and research, administrative duties, academic environment and freedom were the main factors collected from the questionnaire and except that demographic factors were also collected. Employee satisfaction is measured with six questions in the questionnaire and all the measured variables were categorical variables. Different regression techniques such as ordinal regression, multinomial logistic regression and categorical regression were used to test for the relationship between key factors and employee satisfaction. Three regression techniques resulted in 3 different models and the sector was significant in all three models. Analysis of demographic factors with employee satisfaction resulted in a model with only two factors sector and salary from ordinal regression. Multinomial logistic regression resulted in 3 factors sector, salary and gender. Categorical regression resulted in a model with 3 factors gender, sector and distance. Before analyzing the factors, in the questionnaire, reliability analysis was done with chronbach's alpha and in order to make some of the factors consistent, recoding was done for some questions. Main factors were analyzed with the 3 regression techniques and resulted in 4 models. By comparing the models with R-squared values and goodness-of-fit statistics, the appropriate model was obtained from ordinal regression. This study revealed that, co-workers' behavior, physical conditions, Teaching and Research, Administrative duties and academic environment were not more significant factors in predicting employee satisfaction of academics in Sri Lanka.

Key Words: Employee Satisfaction, Ordinal Regression, Multinomial Logistic Regression, Categorical Regression

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List of Abbreviations

HR – Human Resource

ANOVA – Analysis of Variance

MANOVA – Multivariate Analysis of Variance

CATREG – Categorical Regression

UK – United Kingdom

UGC - University Grants Commission

KMO Test - Kaiser-Meyer-Olkin Test

AIC - Akaike Information Criterion

BIC – Bayesian Information Criterion

IT – Information Technolog

(-2LL) – (-2 Log Likelihood)

CHAPTER 01
INTRODUCTION

1.1 Background

The study is mainly focused on use of statistical modeling in predicting employee satisfaction of Sri Lankan academics. Different statistical methods have been used in literature for analyzing employee satisfaction. Descriptive statistics, chi-square tests and linear regression models have been regularly used in the literature to analyze employee satisfaction. But most of the techniques are unable to fit into the given data set due to some limitations of those techniques. For example when there is a categorical dependent variable, linear regression is not applicable. More often satisfaction is measured as a categorical variable, since it is qualitative. In that case linear regression is not possible to use due to different assumptions it is holding. Therefore this study will recognize the most appropriate statistical model to predict the employee satisfaction of academics in Sri Lanka.

Higher education helps the development of a country in different ways (Tahir, 2010). Undergraduates in higher education sector are the next work force in the country. Therefore it is important to educate them well with a thorough technical and theoretical knowledge. The academics in the universities are responsible for facilitating the students. Thus it is crucial to more focus on job satisfaction of academics.

A good university environment will increase the employee satisfaction of academics and at the same time it will improve the efficiency of the university. Employee satisfaction is affected by several factors such as the supervisor behavior, co-worker behavior and etc. (Lane, 2008). Most studies (Wu, 1996) suggest that, to predict the satisfaction of academics, best predictors are internal factors. But it has found that external factors also affect the employee satisfaction (Dvorak, 2001). These internal factors include satisfaction that comes from teaching. External factors include salary, supervisor behavior and co-worker behavior and etc. When the academics are not well supported, they are not motivated to do their job. Then they want to change the institution. (Smith, 2007) has found that teachers who had planned to leave the university, were not satisfied with the job and they had no plan to stay in the same profession in future.

Therefore this study developed a suitable statistical model for employee satisfaction based on the factors in the questionnaire. Further this analysis allows identifying the factors affecting employee satisfaction

1.2 Significance of the Study

This study is carried out to analyze the employee satisfaction of academics in Sri Lanka. The main focus of this analysis is not on employee satisfaction, but it is more towards statistical modeling. When it measures employee satisfaction, most of the variables that are going to collect are categorical variables. Therefore this analysis involves much of categorical data analysis. Most of the previous researches in the same context have used statistical techniques such as descriptive statistics, cluster analysis, discriminant analysis, linear regression analysis and Chi-squared tests. Therefore this research will discuss and analyze regression techniques which can be applied for this kind of a categorical data set. Further the findings will be added to the existing knowledge on application of statistical models in analysis of employee satisfaction. It will form a basis for further research on employee satisfaction of academics.

Academic staff is the most important component in a higher educational institute (Kodithuwakku, 2017), because academic staff members act as an interface between students and management (Tai, 2014). To achieve the required standards in the education sector the academics need the freedom to carry out their work. According to (Rashid, 2011), satisfaction is examined for the physical and mental health of the employee.

Analysis is on employee satisfaction of academics in Sri Lanka. It is important to identify the factors affecting employee satisfaction of the university lecturers, because then those factors can be used to retain the employees in the institute/University for a long time.

1.3 Objectives of the Study

Main objective of this study is,

- Determining an appropriate statistical model for employee satisfaction of academics in Sri Lankan universities which can be predicted from the factors in the questionnaire

Minor objective,

- To identify the demographic factors affecting satisfaction of academics in Sri Lankan universities

1.4 Organization of the Thesis

This section explains the topics background of the study, significance of the study, objectives of the study, research methodology. Similar researches that have been done in the domain of the employee satisfaction are discussed in the second section. Literature is discussed with respect to different perspectives such as employee satisfaction, ordinal regression and multinomial logistic regression. Section three describes s all the methods and techniques used to analyze the data set. Different methods used to model the data set and the measures for goodness-of-fit are discussed in this section. Section four describes the preliminary analysis. This section includes the analysis of demographic factors. Further, 3 different regression methods were applied with demographic factors and employee satisfaction. Section five describes the analysis of the questions of the questionnaire with respect to three different regression techniques. It includes all the results and the models obtained from the analysis. Last section; chapter 6 includes conclusions, limitations of the research and further research.

CHAPTER 02
LITERATURE REVIEW

Various statistical techniques such as descriptive statistics, regression methods, clustering techniques and etc. have been found in the literature to analyze to study satisfaction with different explanatory variables. These methods are used to find the outcome variable based on explanatory variables. Descriptive statistics commonly used in relation to satisfaction means, modes, percentages, and frequency counts. They detect either high or low levels of satisfaction. Following sections review the background of the study and some previous researches on different statistical methods applied in analyzing satisfaction questionnaires.

2.1 Background of the Study

Organizations require their employees to be satisfied in their jobs (Oshagbemi T. , 2003). Employee satisfaction significantly affects performance of the job, non-attendance, turnover, and mental grief (Andrisani, 1978) (Davis, 1992) (Spector, 1997). Unhappy employees are expected to be absent and they no longer want to work in the current institute. Thus employee satisfaction may be associated with performance, organizational efficiency and other matters, including labor turnover (Dickter, 1996) (Lee T. M., 1999) (Melamed, 1995) (Sekoran, 1978). Employee satisfaction is crucial because it influences the performance of the organization. (Lee T. W., 1988) Showed that employee satisfaction is a good predictor of turnover. (Williams, 1995) Have shown that remuneration influences the satisfaction.

In the proposed research, it is going to measure employee satisfaction of academics in Sri Lanka. (Perkins, 1973) Proposed that an academic should perform three most important functions and they are teaching, research, administration and management.

There are two types of job satisfaction according to (Mueller, 2008). They are global job satisfaction and job facet satisfaction. Global job satisfaction means the feelings on their jobs in general. Job facet satisfaction refers to feelings about specific job aspects, such as remuneration, co-worker behavior, supervisor behavior and etc. This questionnaire can measure both types of job satisfaction.

2.2 Review of researches based on Ordinal Regression

Following are some of the researches which have used ordinal regression in modeling data. Ordinal regression is used in many different areas and some of them are discussed below.

(Wainaina, 2012) Has done a research to measure employee satisfaction of the staff in call centers. This research has used ordinal regression models to make predictions. This research has explored the factors affecting employee satisfaction of employees in call centers and many factors are identified.

(Aisyah Larasati, 2012) has carried out a study to predict the customer satisfaction in a restaurant. Data had collected using a questionnaire. Two methods were used to model the data. They are neural network method and a logistic regression method. Based on the results, this research has come to a conclusion that the neural network method is better than the logistic regression method. Neural network model cannot be considered as the best suitable model since it cannot be proven using a statistical method.

(Antonio Paulo, 2016) Has carried out a research to examine the employee satisfaction of physicians who work in adult intensive care units. The questionnaire had distributed among the respondents to collect the demographic factors of the physicians. The analysis is done using the ordinal regression models.

(Laura Eboli, 2009) Has done a research to measure air passenger satisfaction. Modeling is done by the logistic regression approach.

(Jos´e Luis Vicente, 2014) Has developed a method called Ordinal Logistic Biplot to measure the employee satisfaction of doctorate degree holders in Spain. A proportional odds model is used for the predictions.

(Susan C. Scott, 1997) has done a research to measure the back pain. Two ordinal models had compared, and the different methods were considered to evaluate the model. They have concluded that ordinal regression is a strong method and produces an interpretable parameter. Thus this evidence provides a proof for us to apply ordinal regression in the proposed method.

(Chen & Hughes. John, 2004), Has done a research to measure the student satisfaction against the demographic data. They have used ordinal regression to do the analysis and model adequacy is measured by evaluating the model assumptions.

According to the literature, most of the researches that have used ordinal regression are from the fields of clinical research, epidemiological studies, applications in geography, ecological studies and cost estimations. But very less applications are from employee satisfaction domain. Some of those researches are reviewed above. Whenever there is an ordinal dependent variable, ordinal regression can be applied. Thus it confirms that ordinal regression is a perfect method to use in predicting employee satisfaction.

2.3 Review of researches based on Multinomial Logistic Regression

Several researches which have used multinomial logistic regression in measuring employee satisfaction are reviewed below.

In (Tahir, 2010), Multinomial Logistic Regression is applied to predict the employee satisfaction of academics in Universities of Lahore Pakistan. The data was analyzed using Multinomial Logistic Regression. The results indicate that health and medical facilities, training and policies affect the employee satisfaction.

(Madhu, 2012) Examines the factors which affect the work pressure of the employees in the manufacturing trade in India. As the independent variables they had considered seven factors. Multinomial logistic regression model was applied to do the predictions.

(Yousra H. AL JAZAIRY1, 2014) Has done a research to find the job satisfaction of dental supporters. They had done a survey to gather data from a questionnaire.

Multinomial logistic regression was applied to predict the employee satisfaction. Factor analysis had also carried out and it had suggested that five factors were associated with job satisfaction.

(Nor Amira Mohamad, 2016) Has used a multinomial logistic regression to measure the work stress of school teachers in Kedah. The results had indicated that work stress of teachers was related to age, marital status, amount of work they do and the responsibility of the job.

(Prasad, 2016) Has done a research to study the causes of work stress with the performance of the teachers in Hyderabad. A survey is done with 300 respondents. To measure the reliability Cronbach's alpha had used. This study has used multinomial logistic regression for the prediction purpose.

(Satyakama Paul, 2014) Has done a study to measure the customer satisfaction of a South African car company using multinomial logistic regression. This method is applied to find the effect of the predictors on the customer satisfaction.

Most of the researches reviewed above are related to employee satisfaction. Multinomial logistic regression is applied in all the researches and different factors affecting employee satisfaction are recognized.

2.4 Employee Satisfaction

Following are some of the past researches that have been done in the employee satisfaction domain.

(Rajapakshe, 2007) Has done a research to find a relationship between performance of academics and the academic environment. The study is carried out for academics in Thailand. It had found that behavior of the co-workers, job itself and freedom are significant factors. This study had used MANOVA and descriptive statistics for the analysis process. Since all the variables are ordinal variables, it has to use categorical regression methods in analyzing. The same questionnaire used in (Rajapakshe, 2007) is used in this study.

(Oshagbemi T. , 1997) Has done a study to assess the employee satisfaction of the academics and other non academic staff in the universities. The study has grouped the respondents into workers, managers and academics based on the characteristics of their jobs. In here it has clustered university teachers in UK into 3 groups: happy workers, satisfied workers and unhappy workers. Clustering techniques are used in the analysis process.

(Hagedorn, 1994) Has done a research to measure the satisfaction of academics. It has considered different variables salary, co worker behavior, administrative duties and etc. 248 responses had collected for the analysis process. In here it has used Importance Satisfaction model, which is not much related to a statistical background.

In (Ceylan, 2009), they have used different statistical techniques such as, reliability analysis, factor analysis, correlation coefficients and regression analysis. They have used a linear regression model although it is not well appropriate in modeling categorical data. In the proposed method, it is going to apply ordinal regression, categorical regression and multinomial logistic regression models.

In (Aguilar, 2009) also, they have used Regression Analysis and reliability analysis. Same as in (Ceylan, 2009) they have derived a regression model for employee satisfaction and here it has considered more independent variables. Although the dependent variable is a categorical variable, they have considered linear regression analysis, which is not relevant in modeling the actual scenario.

In (Welly, 2014), to collect the data it had used Job Descriptive Index (JDI) Questionnaire. Data set is analyzed with Descriptive Statistics. Pearson product-moment Correlation Test has found that all independent variables are significant and have positive relationship with overall job satisfaction.

In (Dziechciarz-Duda, 2005), it has used multivariate analysis and clustering techniques which are the same approach as (Oshagbemi T., 1997). Using these methods it has clustered the employees into three categories. This method is a different method compared to the techniques used in the proposed method, because here it has done a grouping and proposed method introduces a model.

To determine the job satisfaction of academics (M. Bojadjiev, 2015) has carried out a research. This study had used a questionnaire to all teachers at a Higher Education Institute in Taiwan. They had collected 192 responses. In this research, reliability analysis and some statistical methods were used for the prediction process.

In (Kodithuwakku, 2017), the study is carried out to measure the employee satisfaction of the academics in Sri Lanka. A survey had conducted and 720 responses had obtained. The analysis was done with Student's t-test, one-way ANOVA table and Pearson Correlations method. This study has used extremely simple statistical methods, namely student's t-tests and one-way ANOVA tables though it is suitable to use techniques related to categorical data analysis. This analysis had not gone through a profound statistical analysis.

Most of the researches reviewed above are related to employee satisfaction. Some of them have used linear regression analysis and some have used very light statistical techniques such as student's t test, ANOVA and MANOVA, which are not much appropriate to use with ordinal dependent variables.

Currently, the main problem at hand is analyzing categorical data related to employee satisfaction using an accurate statistical method. Most of the researches that have been done in this domain have used techniques such as simple linear regression, although it is not apposite in analyzing a categorical dependent variable. Therefore proposed method will use ordinal regression, multinomial logistic regression and categorical regression in predicting employee satisfaction. These methods are well apposite in scenarios when there is a categorical dependent variable. Further this study allows comparing the three statistical techniques.

CHAPTER 03

Methodology

3.1 Research Design

This study is a survey research and the data is collected with a questionnaire. To analyze the data, different statistical methods were used. The unit of analysis is an academic from a Sri Lankan University.

3.2 Population and Sample

Data collection was a challenging task since it has to collect data from the academics in Sri Lanka. In this context, population is all the university academics in government and private both sectors in Sri Lanka.

Today, there are seventeen state universities, nine Institutes and seven Post Graduate institutes available in the Tertiary Education system in Sri Lanka. Currently there are 15 government universities in Sri Lanka (Ministry of Higher Education, Sri Lanka, 2018).

All these government universities employ around 5440 permanent university lecturers in all the universities according to (University Grants Commission, 2016). Still there is no record on the number of academics in private sector.

Thus the sample of the data should be composed of data from government and private universities both. Data collection was done during December 2017 to January 2018. Initially the questionnaire was designed by considering the previous researches that has been done in this domain. Accordingly questionnaire was designed by considering (Rajapakshe, 2007). After designing the questionnaire, to collect data, Google form and a hard copy both were used.

3.3 Questionnaire Design

For this research, the initial stage was to design the questionnaire. It was designed based on previous researches and specifically (Rajapakshe, 2007) has considered. Questionnaire consists of some demographic data and also it covered different areas such as behavior of the supervisor, relationship with the colleagues, job itself, physical surroundings, teaching and research, executive duties, university atmosphere and freedom. In order to measure each of the areas above, questions were included from each area. Collected demographic data includes age, gender, academic rank, sector, field of lecturing, years of service, salary, distance to work location and number of research papers published.

Questionnaire consists of 6 questions to measure employee satisfaction. In order to have a single response, mode of all the 6 questions was taken and it was used as the dependent variable.

3.4 Data Collection

When collecting the elements for the sample, haphazard sampling was used. It is a non-probability sampling technique. With this sampling technique elements are selected in an aimless. The rationale for using this sampling method is due to lower cost, speedy data collection and availability of population selection.

1116 questionnaires were spread over academics in all private and government universities in Sri Lanka. Through E mails, questionnaires were sent to 1016 respondents as a Google form and 190 responses were received. Another 70 printed copies of the questionnaire were given to 70 academics and all the 70 responses were received. The questionnaire has been sent to 1116 academics in Sri Lanka, and only 260 responses were received. Out of all 260 responses, only 230 could be used for the analysis process due to incomplete responses. Some of the questionnaires were filled with the same answer for all the questions. They were also not included in the analysis process. Therefore the response rate was around 23.3% which is a very low value. Once the questionnaires were collected, data is entered into SPSS file.

3.5 Proposed Model

After studying the literature, questionnaire was designed based on previous researches, specifically (Rajapakshe, 2007) has considered.

Questionnaire is used to collect demographic data and those include age, gender, academic rank, sector, field of lecturing, years of service, salary, distance to work location and number of research papers published.

Main factors collected from the questionnaire consist of Superior behavior, co-worker behavior, job itself, physical environment, teaching and research, administrative duties, academic environment and freedom. These factors are illustrated in the Figure 2.1. In order to measure each of the areas above, questions were included from each area.

Questionnaire consists of 6 questions to measure employee satisfaction. To form a single dependent variable, mode of all the 6 questions was taken and it was used as the dependent variable. Table 2.1 includes all the main factors, together with their operational definition extracted from (Rajapakshe, 2007).

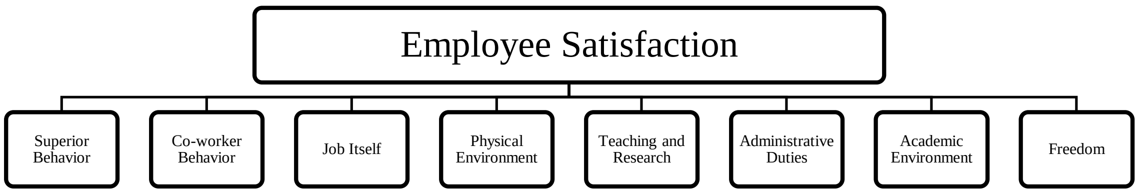

Figure 3.1. Main Factors in the Employee Satisfaction

Table 3.1. Main Factors in the Questionnaire

Dimension	Resource	Operational Definition
Superior Behavior	(Rajapakshe, 2007)	Feelings and attitude towards superiors' assistance and behavioral support
Co-worker Behavior	(Rajapakshe, 2007), (Mueller, 2008), (Hagedorn, 1994), (Prasad, 2016)	The feelings of co-workers' technical proficiency and social support
Job Itself	(Rajapakshe, 2007), (Prasad, 2016), (Yousra H. AL JAZAIRY1, 2014)	The perception of the job itself which provide interesting tasks for lecturers
Physical Conditions	(Rajapakshe, 2007), (Hagedorn, 1994), (Prasad, 2016), (Tahir, 2010)	Feelings and attitudes on existing facilities, aids, environment that make working or doing things easier
Academic Environment	(Rajapakshe, 2007), (Hagedorn, 1994)	Perception towards the environment which affects teaching and research activities
Teaching and Research	(Perkins, 1973), (Hagedorn, 1994), (Prasad, 2016)	The perception of receiving opportunities for imparting abilities and knowledge and for examination to discover new facts
Administrative Duties	(Rajapakshe, 2007), (Perkins, 1973), (Hagedorn, 1994)	The perceptions towards performing administrative duties apart from teaching
Freedom	(Rajapakshe, 2007), (Prasad, 2016)	The perception towards conditions of being free and without constraint

3.6 Methods used for Data Analysis

3.6.1 Chi Squared Test

Chi squared test is used for different purposes. It is used to test for the goodness of fit and as well as to test the independence between categorical variables. When the test is used as a goodness of fit test, sample is selected from the population and then sample statistics are used to infer about the population distribution. The data in the sample is used to check whether the data follows the hypothesized distribution. The purpose of chi square test of independence is to examine whether the variables are independent or not (Durst, 1996).

In this analysis, chi squared test is applied to check the independence among the demographic factors. The procedure of the test of independence is given below.

$\mathbf{H_0}$: X and Y are independent

$\mathbf{H_1}$: X and Y are dependent

Where X and Y are categorical variables.

The test statistic used to do this test is as follows.

$$\chi^2_{(n-1),(m-1)} = \sum_i \sum_j \frac{(O_{ij}-E_{ij})^2}{E_{ij}} \quad \ldots(1)$$

O_{ij} - Observed Frequency

E_{ij} - Expected Frequency

O_{ij} gives the numbers of cases in each cell of the cross classification table (two-way contingency table).

$$E_{ij} = \frac{Row\ Total \text{ x } Column\ Total}{Grand\ Total} \quad \ldots(2)$$

For all the cells in the contingency table, E_{ij}s has to be calculated and then the test statistic can be calculated.

Test statistic is following a chi squared distribution.

Degrees of freedom = (number of rows -1)(number of columns -1).

The chi square statistic is calculated according to above equation (1), and if this statistic is in the rejection region then null hypothesis is rejected and it implies that the two variables are not independent. If the chi square statistic is not in the rejection region, then it can be concluded that the two variables are independent (Durst, 1996).

3.6.2 Multinomial Logistic Regression

This method is used when there is a nominal dependent variable with greater than two categories. Multinomial logistic regression is a predictive analysis. It is applied to describe the relationship between one nominal dependent variable and predictors.

In some situations, when the response is ordinal, ordering is not taken into account. Ordinality is important and neglecting that information will lead to sub-optimal models.

When there are different categories in the response variable which are not ordinal, then the least square estimator cannot be used. Instead, a maximum likelihood estimator should be used. That is multinomial logit model or multinomial probit model can be used.

3.6.2.1 Fitting a binary logistic model

Initially it is going to discuss a binary logistic regression model and here, regression coefficients are used to forecast the probability of the response variable. Following equation shows the binary logistic model.

$$\ln\left(\frac{prob(event)}{1-prob(event)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \ldots\ldots(3)$$

The component in the Left hand side is called as a logit. Coefficients in the logistic regression model give the amount of change of the logit according to the values of the independent variables.

3.6.3 Ordinal Regression

Number of logistic regression models have been developed for analyzing ordinal response variables (Armstrong BG, 1989).

There are several assumptions involved with the ordinal regression. First one is that the dependent variable should be an ordinal variable. Next is that, independent variables should be continuous, categorical or ordinal. Further independent variables should not be correlated or no multi-collinearity should present in the data set. Another most important assumption is that proportional odds assumption. That is every independent variable has the similar influence on cumulative split of the ordinal variable. Model assumptions are tested to test the validity of the model (Kwak & Clayton-Matthews, 2002).

3.6.3.1 Formulating an ordinal logistic regression model

The basic form of a Generalized Linear Model is given by the following equation.

$$link(\gamma_{ij}) = \theta_j - [\beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{iJ}] \quad \ldots\ldots(4)$$

Where

link () is the link function

γ_{ij} is the cumulative probability of the j^{th} category for the i^{th} case

θ_j is the threshold of the j^{th} category

p is the number of regression coefficients

$x_{i1}, \ldots, x_{ip}$ are the values of the predictors for the i^{th} case

$\beta_1, \ldots \beta_p$ are regression coefficients

3.6.3.2. Link Function

This function is used to transform the cumulative probabilities. They are used to estimate the model coefficients. Table 3.1 shows the available link functions.

Table 3.1. Link Functions

Function	Form	Typical Application
Logit	$log(\xi/(1-\xi))$	Evenly distributed categories
Complementary log-log	$log(-\log(1-\xi))$	Higher categories more probable
Negative log-log	$-\log(-\log(\xi))$	Lower categories more probable
Probit	$\phi^{-1}(\xi)$	Latent variable is normally distributed
Cauchit (Inverse Cauchy)	$tan(\pi(\xi-0.5))$	Latent variable has many extreme values

3.6.3.3 Model Assumptions

- **Parallel Lines**

  Ordinal regression assumes that the coefficients that describe the relationship between, the lowest versus all higher categories of the response variable are the same as those that describe the relationship between the next lowest category and all higher categories, etc (O'Connel, 2006). Because the relationship between all pairs of groups is the same, there is only one set of coefficients. Thus, in order to test the goodness-of-fit proportional odds assumption is normally evaluated with the test of parallel lines (O'Connell, 2000).

- **Adequate Cell Count**

  Usually 80% of cells should have more than 5. When there are cells with zeros it designates as a missing value. More cells with zeros can produce imprecise chi-square test. Usually model adequacy is tested with the chi-square test. Therefore it is important to have the adequate cell count (Agrcsti, 2002).

3.6.3.4 Interpreting the SPSS output for ordinal regression

Tables obtained from the SPSS output are explained below.

Table 3.2. Model Fitting Information

Model	-2 Log Likelihood	Chi-Square value	Degrees of Freedom	Significance
Intercept Only	A			
Final	B	C	D	E

Hypothesis underlying table 3.2 is as follows.

H0: Baseline intercept-only model is significant

H1: Final model is significantly enhanced than the baseline model

For this particular test, test statistic is as follows.

$$\text{Test Statistic} = C = \chi^2 = [-2\text{Log Likelihood (baseline)}] - [-2\text{Log Likelihood (new)}] \quad \ldots\ldots (5)$$

According to the above table,

Test Statistic = A - B

With degrees of freedom = D = $k_{Baseline} - k_{Final}$

Where k = number of parameters in each model

Table 3.1 is given by SPSS as the output of the ordinal regression which is model fitting information. Initially it is essential to find out whether the model can predict the outcome. In order to do this, 2 models are compared and those are model without any prdictors and the model with the predictors (Final Model). The model fitting information table gives the -2 log-likelihood values for the above 2 models. A and B are the -2 log-likelihood values for the baseline model and the final model respectively. SPSS performs a chi-squared test to test the difference between the -2 Log Likelihood values for the two models. Calculated chi squared statistic is indicated by C and the corresponding p-value is given by E. If the value E is less than 0.05 it implies that chi square statistic is significant and it indicates that the Final model is better than the baseline model (National Centre for Research Methods, 2011).

Table 3.3.Results of Goodness of fit test

	Chi-Square value	Degrees of Freedom	Significance
Pearson	A	C	E
Deviance	B	D	F

Hypothesis underlying the table 3.2 is as follows.

H_0: Data is consistent with the model. (Fit is good)

H_1: Data is not consistent with the model. (Fit is not good)

In here 2 hypothesis tests are done and the first test uses the Pearson chi square statistic (given in equation 1) and the second test uses deviance statistic (given in equation 5).

Table 3.3 gives Pearson's chi-square value for the model. Another chi-square statistic given in Table 3.3 is deviance measure. These values are used to check whether the model fits the data well. The Null hypothesis is that model fits the data. If it is not rejected then the conclusion is that the model is good. However if null hypothesis is rejected, then the conclusion is model does not fit the data well.

It is not suitable to highly rely on these values, because if the sample size is large then chi-square test tends to become significant. Chi square test is very sensitive to empty cells. When there are large number of categorical explanatory variables and continuous variables, there are empty cells (National Centre for Research Methods, 2011). In such situations, it should not be dependent on these tests. Pseudo R-square statistics are advised to consider as the goodness-of-fit tests for the above type of models.

Table 3.4. Pseudo R-Square Table

Cox and Snell	A
Nagelkerke	B
McFadden	C

Above Table 3.4 gives pseudo R-square values. In linear regression R^2 explains the percentage of variance of the response variable which can be explained by the model. For logistic and ordinal regression models pseudo R-square values are calculated.

Table 3.5. Results of the Test of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Null Hypothesis	A			
General	B	C	D	E

Hypothesis underlying the table 3.5 can be given as follows.

H_0: Coefficients of slope in the model are same for all the categories of the response variable (Accept the proportional odds assumption)

H_1: Coefficients of slope in the model are not same for all the categories of the response variable (Reject the proportional odds assumption)

Table 3.5 illustrates, Test of parallel lines. This test is used for the purpose of testing proportional odds assumption. According to Chi-Square statistic if the null hypothesis is rejected, then the conclusion is that ordered logit coefficients are not equal across the different categories of the response. If the null hypothesis is not rejected, then it indicates that proportional odds assumption is accepted.

3.6.4 Categorical Regression

Categorical regression is used to predict the categorical responses. It is also known as CATREG.

Categorical Regression results in an equation for the transformed variables. In this method, distributional assumptions are not made about the variables. (IBM Knowledge Center, 2011).

The Categorical Regression objective is to find the set of y_r, b and y_j , $j \epsilon J_p$, so that the function

$$\sigma(y_r; b; y_j) = \left[G_r y_r - \sum_{j \epsilon J_p} b_j G_j y_j\right] W \left[G_r y_r - \sum_{j \epsilon J_p} b_j G_j y_j\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Is minimal, under the normalization restriction $y_r' D_r y_r = n_w$. The quantifications of the response variable are also centered; that is they satisfy $u' W G_r y_r = 0$ with u denoting an n-vector with ones.

3.6.4.1. Interpreting the SPSS output for Categorical regression

Table 3.6. Model Summary for the categorical Regression Model

Multiple R	R Square	Adjusted R Square	Apparent Prediction Error
A	B	C	D

As in the linear regression, measurement used to evaluate the model fit is R^2. R^2 measures the amount of variance of the response explained by the predictors in the model. When the R^2 is closer to 1, it indicates that the model can explain a considerable amount of variation of the dependent variable. The value is given by B in the table 3.6.

Table 3.7. ANOVA Table for categorical Regression Model

	Sum of Squares	Degrees of Freedom	Mean Square	F- Value	Significance
Regression	A	D	H	F	J
Residual	B	E	I		
Total	C	G			

H_0: The model is not significant

H_1: The model is significant

Table 3.7 gives the ANOVA table obtained from the categorical regression output. To test the significance of the model, ANOVA table is used. Significance value corresponding to F-value is given by value J and if it is less than 0.05 then null hypothesis is rejected at 5% level of significance. If the null hypothesis is rejected at 5% level of significance then it can be concluded that model is significant.

Table 3.8. Coefficients Table for Categorical Regression Model

	Standardized Coefficients		Degrees of Freedom	F – Value	Significance
	Beta	Bootstrap (1000) Estimate of Std. Error			
Predictor 01	J	M	P	U	X
Predictor 02	K	N	Q	V	Y
Predictor 03	L	O	R	W	Z

Table 3.8 shows the standardized regression coefficients. In categorical regression variables are standardized. When the standardized coefficients are divided by the standard errors F values can be calculated. The F test is used to find whether there is a significant decrease in predictive ability of the model if a predictor is removed from the model.

Table 3.9. Correlations and Tolerance

	Correlations			Importance	Tolerance	
	Zero-Order	Partial	Part		After Transformation	Before Transformation
Predictor 01	A	D	I	L	O	R
Predictor 02	B	E	J	M	P	S
Predictor 03	C	F	K	N	Q	T
Dependent Variable: Employee Satisfaction						

In order to interpret the predictors of the regression model, the correlations, partial correlations, and part correlations should be analyzed. All this information is given in Table 3.9.

Zero-order correlation is the correlation among the transformed independent variables and the transformed dependent variable.

The squared partial correlation represents the percentage of the variance explained compared to the residual variance of the dependent variable remaining after eliminating the effects of the other variables.

Instead of eliminating the effects of variables from both the dependent and independent variables, the effects from just the independent variable can be removed. Part correlation is the correlation among the dependent variable and the residuals. Squaring this value gives a value which indicates the amount of variance explained compared to the overall variance of the dependent variable.

Importance values represent the contributions of independent variable to the regression and the sum of all these values is equal to R^2. When the importance values are high it indicates that those are most affecting variables to the regression. Pratt's measure is calculated by multiplying regression coefficient and the zero-order correlation.

If the tolerance value is close to 1, then one independent variable cannot be represented by the other independent variables. That is multicollinearity is not present in the data set. When there are huge negative values for the importance measure, it implies that there is a correlation among the predictors.

If there are higher tolerance values and close to 1 then it indicates that multicollearity is not present among the predictors.

3.6.5 Measures of Model Fit

Seven measures are explained here to measure the model-fit.

(1) Deviance

(2) Akaike Information Criterion

(3) The Bayesian Information Criterion

(4) McFadden‘s

(5) Cox and Snell Pseudo and

(6) Nagelkerke Pseudo

(7) Test of Parallel Lines

It is not possible to conclude that; model with the highest values of a given statistic can result in the best model (Long & Freese, 2001). However, different measures of goodness of fit are discussed below.

3.6.5.1 Deviance

Deviance measures the residual deviance for the model. From the expected and observed frequencies, Deviance goodness-of-fit measure can be computed.

As a first measure of model of fit, the researcher uses the Residual Deviance (D) for the model.

The Deviance measure is,

$$D = 2\sum\sum O_{ij} ln\left(\frac{O_{ij}}{E_{ij}}\right) \quad (7)$$

Where

O_{ij} refers to Observed Frequency

E_{ij} refers to predicted or expected frequency

If there is a continuous independent variable or many categorical independent variables or some independent variables with many values, then the expected values will be small.

If the model fits well, the expected frequencies and observed frequencies should be almost similar. Therefore value of each statistic should be small. Therefore if the p-value or the significance value is large then the conclusion is that the model fits the data well.

3.6.5.2 Akaike information criterion

This is used to find the best model out of several models by doing comparisons between them. As the second measure of goodness of fit, Akaike Information Criterion is used and can be defined as follows.

$$AIC = -2(log - likeliood) + 2K \quad (8)$$

Where

K refers to the number of model parameters (Number of variables in the model with the intercept)

Log-Likelihood is a measure of model fit. Higher the number, better the fit and it is obtained from the statistical output. A model having smaller AIC is considered as the better fitting model.

3.6.5.3 Bayesian information criterion

Bayesian Information Criterion is used as a goodness of fit measure and therefore can be used to select a model from several models. It is also known as Schwarz criterion. It is approximately linked to Akaike Information Criterion (AIC). (Raftery, 1995)

BIC is defined as follows.

$$BIC = -2.\ln L + k.\ln(n) \quad (9)$$

Where

n – the number of observations

k – number of free parameters to be estimated with the intercept

L – the maximized value of the likelihood function for the estimated model

3.6.5.4 McFadden's adjusted R^2

It is also called as Likelihood ratio index. It compares the model with the predictors and the baseline model.

$$R_M^2 = 1 - \left(\frac{L(\hat{B})}{L(B^{(0)})}\right) \quad (10)$$

Where

$L(\hat{B})$ refers to the log-likelihood function for the model

$L(B^{(0)})$ refers to the log-likelihood with just the thresholds

3.6.5.5 Cox and snell pseudo R^2

Cox and Snell's R^2 is based on calculating the percentage of unexplained variance which is reduced by adding variables to the model. This measure is similar to R^2 in linear regression. The maximum value that this measure can hold is 0.75.

$$R_{CS}^2 = 1 - \left(\frac{L(B^{(0)})}{L(\hat{B})}\right)^{\frac{2}{n}} \quad \text{......(11)}$$

3.6.5.6 Nagelkerke pseudo R^2

The Nagelkerke measure gives an alternative to Cox and Snell's R^2 , because the highest value that this measure can have is equal to 1. This measure varies from 0 to 1.

$$R_N^2 = \frac{R_{CS}^2}{1 - L(B^{(0)})^{\frac{2}{n}}} \quad \text{......(12)}$$

3.6.5.7 Test of parallel lines

The purpose of this test is used to test a key assumption in ordinal regression. As mentioned earlier in section 3.4, the assumption is that each independent variable has the similar effect at each cumulative split of the ordinal response.

Proportional odds assumption is always rejected due to higher number of explanatory variables, continuous predictors in the model and large sample size (O'Connel, 2006). Therefore this assumption is called as anti-conservative (Allison D., 1999).

3.6.6 Residual Analysis

The Pearson residual is a standardized difference between the observed and predicted values. It can be calculated by the following equation.

$$Pearson\ Residual = \frac{O_{ij} - E_{ij}}{\sqrt{n_i \widehat{p_{ij}}(1 - \widehat{p_{ij}})}} \quad \text{......(13)}$$

A standardized Pearson residual has a standard normal distribution. If the absolute value of the Pearson residual exceeds 2 or 3 then it indicates that model does not fit the data well (Agresti A. , 2013).

3.6.7 Reliability Analysis

Cronbach's alpha is used to measure the reliability, or internal consistency, of a set of variables. In other words, Cronbach's alpha used to assess the strength of the consistency (Dennick, 2011). The equation can be given as follows.

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum_{i=1}^{k} \sigma_{y_i}^2}{\sigma_x^2}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

Where

k refers to the number of scale items

$\sigma_{y_i}^2$ Refers to the variance associated with item i

σ_x^2 Refers to the variance associated with the observed total scores

Alternatively, chronbach's alpha can be defined as:

$$\alpha = \frac{k \times \bar{c}}{\bar{v} + (k-1)\bar{c}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

Where

k refers to the number of scale items

$\bar{c}$ Refers to the average of all covariances between itemge variance of each items

$\bar{v}$ refers to the average variance of each item

Chronbach's Alpha is a value between 0 and 1. If all of the items are independent then it indicates that they are not correlated. α is close to 1 if the other items have high covariances.

The rule of thumb for interpreting alpha can be represented by the table 3.10 (Dennick, 2011).

Table 3.10. Internal Consistency according to Chronbach's Alpha

Chronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$\alpha < 0.5$	Unacceptable

CHAPTER 04

ANALYSIS

4.1 Analyzing Demographic Factors

This section presents an analysis of the demographic data using different regression techniques. Initially, the demographic factors are analyzed. Since most of the variables are categorical, pie charts and frequency tables can be used to analyze them. In order to measure the relationship between categorical variables, chi squared test was used. There were 6 questions to measure the employee satisfaction and mode of all the 6 questions was used as the dependent variable, which measures the employee satisfaction.

4.1.1 Age

Age is an important demographic factor which can be used to analyze employee satisfaction. Age of the respondent can also be a factor which affects the job satisfaction. According to Sri Lanka University Statistics 2016 (University Grants Commission, 2016), Distribution of the lecturers in different age groups in the government universities can be presented in the following table.

Table 4.1. Distribution of Lecturers in different age groups

	Age Group					Total
	21-30	31-40	41 – 50	51 – 60	Greater than 61	
Number of lecturers	491	1631	1635	1056	303	5116
Percentage (%)	9.6	31.88	31.96	20.64	5.92	

According to Table 4.1, most of the lecturers in the population are in the age groups 31-40 and 41-50. In the sample which is used to do the analysis also comprises of the similar distribution of the lecturers in different age groups. Following pie chart shows that, maximum number of respondents are in the age group 30 – 39 which is same as in the population. Therefore sample is not biased with respect to the age group. Figure 1 gives the pie chart for age and it shows the same distribution as the population. Very less respondents are over 60 years.

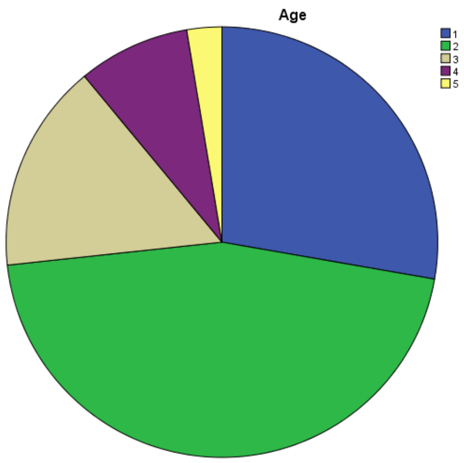

Figure 4.1. Pie Chart for Age

By considering all the dependent variables together, one dependent variable is formed by getting the mode of the variables. Then regression techniques can be applied to test between age and the dependent variable. Ordinal regression and multinomial logistic regression resulted that, age was not significant with employee satisfaction. But categorical regression resulted that age is significant with the employee satisfaction. But it explained only 6% of the variation of the dependent variable.

In (Allison D., 1999), a research is done to find the relationship between age and job satisfaction. Results had indicated a weak positive relationship among age and job satisfaction. That is, age cannot explain a considerable percentage of variance in the job satisfaction measure. This indicates that age is not a good independent variable of job satisfaction.

Since age and employee satisfaction both are categorical variables, in order to test for the dependence chi squared test can be used. Table 4.2 shows the results of the chi squared test.

Table 4.2. Chi Squared test between Employee Satisfaction and Age

	Age	Employee Satisfaction
Chi-Square	108.751[a]	228.576[a]
Degrees of freedom	4	4
Significance	.000	.000

According to Table 4.2, significance value corresponding to chi squared test is less than 0.05 which indicates that employee satisfaction is depending on age. Therefore the conclusion is that there is a relationship between employee satisfaction and age. In order to test the strength of the relationship ordinal regression can be used.

Table 4.3. Model Fitting Information for employee satisfaction and age

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	76.057			
Final	63.596	12.461	4	.014

Table 4.4. Parameter Estimates of the model between employee satisfaction and age

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-3.689	.710	27.021	1	.000	-5.079	-2.298
	[Employee Satisfaction = 2]	-2.531	.666	14.456	1	.000	-3.836	-1.226
	[Employee Satisfaction = 3]	-1.568	.651	5.802	1	.016	-2.843	-.292
	[Employee Satisfaction = 4]	1.444	.649	4.952	1	.026	.172	2.715
Location	[Age=1]	-1.326	.694	3.644	1	.056	-2.687	.035
	[Age=2]	-.591	.671	.777	1	.378	-1.906	.723
	[Age=3]	-.270	.727	.138	1	.710	-1.695	1.154
	[Age=4]	.090	.745	.015	1	.904	-1.369	1.550
	[Age=5]	0[a]	.	.	0	.	.	.

As can be seen from the Table 4.3, model is significant with the p-value of 0.014. Although the model is significant, parameters in the model are not significant at all according to Table 4.4. Therefore this result also agrees with (Allison D., 1999), confirming the fact that age is not a good predictor of employee satisfaction.

4.1.2 Gender

According to the gender, distribution of lecturers in the government universities can be presented in the following table.

Table 4.5. Distribution of respondents according to Sex

	Sex		Total
	Male	Female	
Number of lecturers	2994	2446	5440
Percentage (%)	55.03	44.97	

Table 4.5 shows that most of the lecturers are males, but there is a very small difference between the number of female and male lecturers.

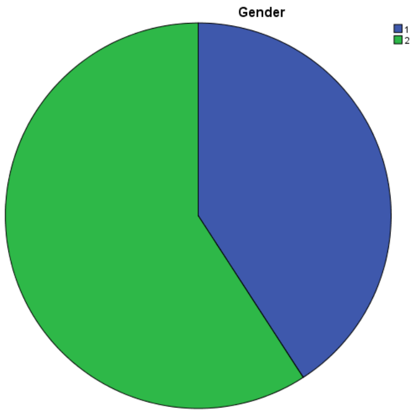

Figure 4.2. Pie chart for Gender

Figure 2 illustrates the pie chart for Gender. According to that, the higher proportion of the sample is female lecturers, which is not similar to population.

According to (Shihadeh, 1994), women are happier with their jobs than men. (Shihadeh, 1994) Have shown that out of all the demographic variables, gender was a significant predictor of job satisfaction. Therefore these results have shown that gender is a significant predictor of job satisfaction.

To test the dependence between gender and employee satisfaction chi squared test is used and the results are given in the following table.

Table 4.6. Chi Squared test Results between Employee Satisfaction and Gender

	Employee Satisfaction	Gender
Chi-Square	228.576[a]	8.843[b]
Degrees of freedom	4	1
Significance	.000	.003

According to Table 4.6, p-value is less than 0.05 and thus there is a relationship between gender and employee satisfaction. To measure the strength of the relationship ordinal regression analysis can be carried out and the results are given below.

Table 4.7. Model Fitting Information for the model between Employee Satisfaction and Gender

Model	-2 Log Likelihood	Chi-Square value	Degrees of Freedom	Significance
Intercept Only	47.782			
Final	39.134	8.649	1	.003

Table 4.8. Parameter Estimates for the model between Employee Satisfaction and Gender

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-2.726	.318	73.419	1	.000	-3.349	-2.102
	[Employee Satisfaction = 2]	-1.575	.210	56.314	1	.000	-1.986	-1.164
	[Employee Satisfaction = 3]	-.620	.173	12.855	1	.000	-.959	-.281
	[Employee Satisfaction = 4]	2.360	.249	90.022	1	.000	1.872	2.847
Location	[Gender=1]	.785	.274	8.210	1	.004	.248	1.322
	[Gender =2]	0[a]	.	.	0	.	.	.

Table 4.7 gives the model fitting information between employee satisfaction and gender. According to that the p-value is less than 0.05 and therefore model is significant at 5% level. Table 4.8 gives the parameter estimates of the model and they

are all significant at 5% level of significance. Above results show that, the model is significant and the parameter estimates are also significant at 5% significance level. It follows that the variation of the employee satisfaction can be explained by gender up to some extent.

4.1.3 Academic rank

Following table shows the distribution of the lecturers according to the academic rank in the population. It indicates that, the highest portion of the lecturers fallen into senior lecturer category and the smallest portion of the lecturers fallen into associate professor category.

Table 4.9. Distribution of the respondents according to academic rank

	Academic Rank				Total
	Professor	Associate Professor	Senior Lecturer	Lecturer	
Number of Lecturers	622	87	2905	1826	5440
Percentage	11.43	1.6	53.4	33.57	

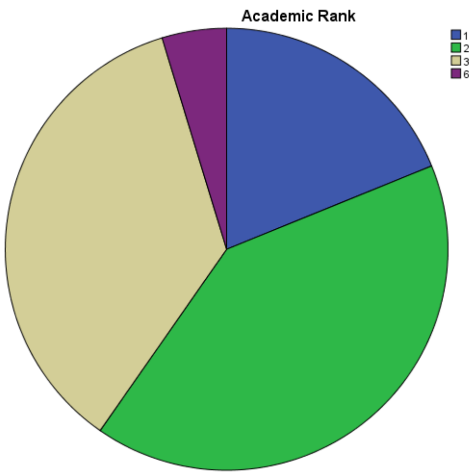

Figure 4.3. Pie Chart for Academic Rank

Figure 4.3 illustrates the pie chart for Academic Rank. According to that, most of the respondents are in the Lecturer and Senior Lecturer category same as in the population. There are no respondents from associate and assistant professor categories. Therefore sample is not a biased sample with respect to academic rank.

According to the literature, academic rank is not a very good predictor of job satisfaction. (Dalton, 1998) Has done a research to find out whether there is a relationship with academic rank and the job satisfaction. For the survey 412 responses were collected from academics. Results had indicated that employee satisfaction does not have a relationship with academic rank.

Chi squared test is used to test the relationship between academic rank and the employee satisfaction. Table 4.10 shows the results of the chi squared test.

Table 4.10. Chi Squared Test Results for Academic rank and Employee Satisfaction

	AcademicRank	Employee Satisfaction
Chi-Square	68.211[a]	228.576[b]
Degrees of Freedom	3	4
Significance	.000	.000

To determine the strength of the relationship ordinal regression is used and the results are given in the Table 4.11.

Table 4.11. Model Fitting Information for the model between Employee Satisfaction and Academic Rank

Model	-2 Log Likelihood	Chi-Square value	Degrees of Freedom	Significance
Intercept Only	69.668			
Final	57.726	11.941	3	.008

According to Table 4.11, model is significant at 5% level of significance, but Table 4.12 shows that most of the parameter estimates of the model are not significant. Therefore it can be seen that academic rank is not a strong predictor of employee satisfaction, as literature also confirms that employee satisfaction does not increase with the academic rank. It also indicates that, parameter estimate for lowest academic rank has become significant. This result reveals that, academics with the lowest rank has become significant in predicting employee satisfaction.

Table 4.12. Parameter Estimates for the model between Employee Satisfaction and academic rank

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-4.107	.612	44.998	1	.000	-5.306	-2.907
	[Employee Satisfaction = 2]	-3.001	.561	28.575	1	.000	-4.101	-1.901
	[Employee Satisfaction = 3]	-2.023	.542	13.926	1	.000	-3.086	-.961
	[Employee Satisfaction = 4]	1.008	.522	3.722	1	.054	-.016	2.031
Location	[AcademicRank=1]	-1.820	.614	8.785	1	.003	-3.023	-.616
	[AcademicRank=2]	-1.102	.568	3.768	1	.052	-2.215	.011
	[AcademicRank=3]	-.772	.565	1.867	1	.172	-1.880	.336
	[AcademicRank=6]	0[a]	.	.	0	.	.	.

4.1.4 Sector

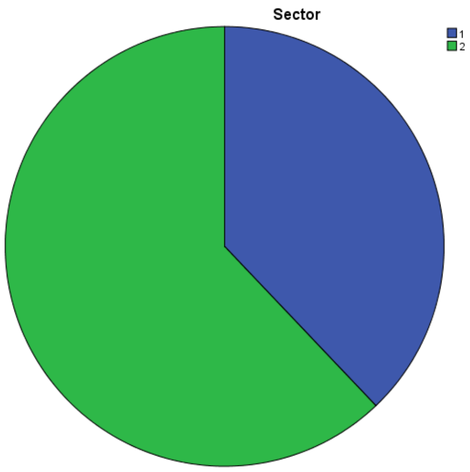

Figure 4.4. Pie chart for Sector

Figure 4.4 gives the pie chart for sector. According to that, most of the respondents are from government sector. (Durst, 1996) Has done a research to find out whether there is an effect from the sector on employee satisfaction. He has found out that when there are different reward systems in private and public sectors, satisfaction levels are also different. This analysis can be used further to check whether there is a relationship between sector and the academic rank in the Sri Lankan context.

Chi squared test resulted in the following table when the dependence is measured between employee satisfaction and sector. According to the table 4.13, p-value is less than 0.05 and therefore it shows that there is a relationship between sector and the employee satisfaction.

Table 4.13. Chi Squared Test Results for Employee Satisfaction and Sector

	Employee Satisfaction	Sector
Chi-Square	228.576[a]	22.207[b]
Degrees of Freedom	4	1
Significance	.000	.000

Ordinal regression is carried out between the employee satisfaction and the sector. The model is significant at 5% significance level according to Table 4.14. As can be seen from Table 4.15, all the parameters are also significant at 5% level. Therefore results indicate that the sector is a predictor which can be used to explain the variation of the dependent variable.

Table 4.14. Model Fitting Information for the model between Employee Satisfaction and Sector

Model	-2 Log Likelihood	Chi-Square value	Degrees of Freedom	Significance
Intercept Only	55.959			
Final	34.700	21.259	1	.000

Table 4.15. Parameter Estimates for the model between Employee Satisfaction and Sector

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-3.598	.349	106.159	1	.000	-4.282	-2.913
	[Employee Satisfaction = 2]	-2.424	.246	96.856	1	.000	-2.907	-1.941
	[Employee Satisfaction = 3]	-1.420	.199	50.927	1	.000	-1.810	-1.030
	[Employee Satisfaction = 4]	1.699	.216	62.137	1	.000	1.277	2.122
Location	[Sector=1]	-1.295	.285	20.716	1	.000	-1.853	-.737
	[Sector=2]	0[a]	.	.	0	.	.	.

4.1.5 Years of service

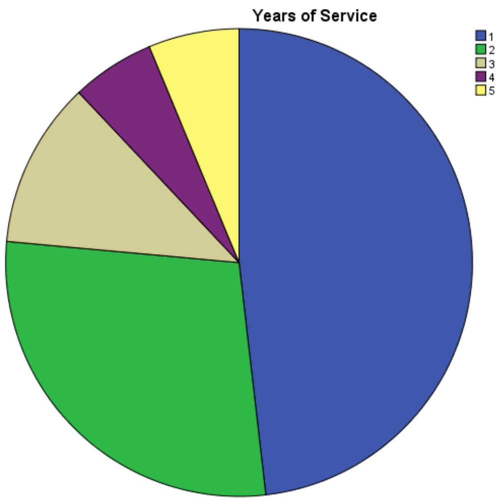

Figure 4.5. Pie Chart for Years of Service

Figure 4.5 gives the pie chart for years of service. According to that, most of the respondents are having below 5 years of service.

(Arthur G. Bedeian, 1992) Had done a study to find the relationship among years of service, age, and job satisfaction. They had found that, years of service is a good predictor of job satisfaction than age.

To determine whether there is a relationship between the years of service and the employee satisfaction chi squared test is used and the resulting table is Table 4.16.

Table 4.16. Chi Square Test Results for Years of Service and Employee Satisfaction

	Employee Satisfaction	YearsOfService
Chi-Square	228.576[a]	112.507[a]
Degrees of freedom	4	4
Significance	.000	.000

Table 4.16 indicated that, p-value is less than 0.05. Therefore chi squared statistic is significant at 5% level of significance. Therefore it shows that there is a relationship between years of service and the employee satisfaction. The outcome of the ordinal regression are as follows.

Table 4.17. Model Fitting Information for the model of Employee Satisfaction and Years of Service

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	73.019			
Final	62.454	10.565	4	.032

Although the model is significant at 5% level of significance according to Table 4.17, parameter estimates are not significant as can be seen from Table 4.18. Therefore it shows that "years of service" is not a good predictor of employee satisfaction and also it cannot be used to explain a considerable amount of the variation of the employee satisfaction. But literature shows that, there is a negative relationship between job satisfaction and the years of service.

But same as in academic rank, in this variable also "years of service" has become significant for lower values.

Table 4.18. Parameter Estimates for the model between Employee Satisfaction and Years of Service

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-3.938	.534	54.380	1	.000	-4.984	-2.891
	[Employee Satisfaction = 2]	-2.792	.475	34.607	1	.000	-3.722	-1.862
	[Employee Satisfaction = 3]	-1.846	.454	16.559	1	.000	-2.735	-.957
	[Employee Satisfaction = 4]	1.160	.437	7.046	1	.008	.304	2.017
Location	[YearsOfService=1]	-1.249	.482	6.716	1	.010	-2.193	-.304
	[YearsOfService=2]	-.956	.501	3.645	1	.056	-1.938	.025
	[YearsOfService=3]	-.354	.585	.367	1	.545	-1.500	.792
	[YearsOfService=4]	-.322	.663	.236	1	.627	-1.622	.978
	[YearsOfService=5]	0[a]	.	.	0	.	.	.

4.1.6 Salary

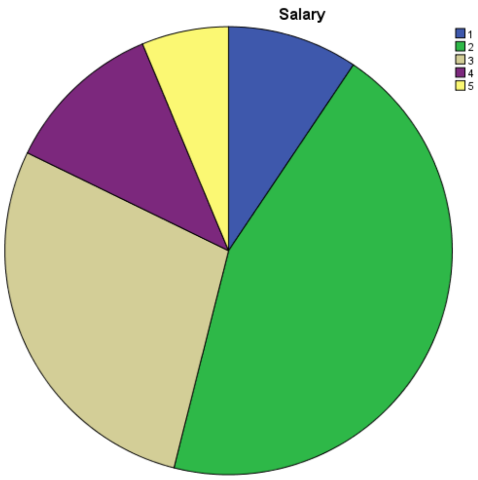

Figure 4.6. Pie Chart for Salary

Figure 4.6 gives the pie chart for salary. According to that, most of the respondents are getting a salary between 50000 to 100000.

(David Bernal, 1998) Had done a study to examine relationship between salary and job satisfaction. Results had shown that salary is related to satisfaction of employees. Therefore according to this study, there is a relationship between salary and job satisfaction.

As can be seen from the Table 4.19, it shows that the p-value is less than 0.05 and therefore it rejects the hypothesis that there is no relationship between employee satisfaction and salary. This indicates that, there is a relationship between salary and employee satisfaction.

Table 4.19. Chi Square Test Results for Employee Satisfaction and Salary

	Employee Satisfaction	Salary
Chi-Square	228.576[a]	93.293[a]
Degrees of Freedom	4	4
Significance	.000	.000

Results of the ordinal regression show that, the model is significant at 5% level of significance as shown in Table 4.20. But Table 4.21 shows that parameter estimates are not all significant; therefore salary is not a viable predictor of employee satisfaction. Literature shows that there is a relationship between employee satisfaction and salary. But it also indicates that, salary is only marginally related to employee satisfaction.

Table 4.20. Model fitting Information for the model between Employee Satisfaction and Salary

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	96.343			
Final	76.324	20.020	4	.000

Same as in years of service and academic rank, category having the lowest values of salary has become significant in predicting employee satisfaction.

Table 4.21. Parameter Estimates for the model between Employee Satisfaction and Salary

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-3.757	.586	41.105	1	.000	-4.905	-2.608
	[Employee Satisfaction = 2]	-2.588	.530	23.799	1	.000	-3.628	-1.548
	[Employee Satisfaction = 3]	-1.600	.510	9.842	1	.002	-2.600	-.601
	[Employee Satisfaction = 4]	1.483	.507	8.540	1	.003	.488	2.478
Location	[Salary=1]	-1.876	.641	8.576	1	.003	-3.132	-.621
	[Salary=2]	-.924	.540	2.924	1	.087	-1.983	.135
	[Salary=3]	.042	.553	.006	1	.939	-1.041	1.126
	[Salary=4]	-.473	.617	.588	1	.443	-1.683	.737
	[Salary=5]	0[a]	.	.	0	.	.	.

4.1.7 Distance to work location

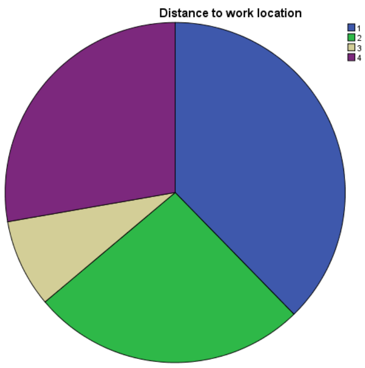

Figure 4.7. Pie Chart for Distance to Work Location

Figure 4.7 gives the pie chart for the variable Distance to work location. According to that, most of the respondents are living very close to work location.

It has analyzed all the demographic variables individually and now it is going to check for the association between these variables. Since all these variables are categorical variables, chi square test can be used to check for the association between 2 variables. Chi square test is applied to find the association between distance and the employee satisfaction and then it resulted in the following table.

Table 4.22. Chi Square Test Results for Employee Satisfaction and Distance to Work Location

	Employee Satisfaction	Distance
Chi-Square	228.576[a]	48.083[b]
Degrees of freedom	4	3
Significance	.000	.000

According to the Table 4.22, chi squared statistic is significant at 5% level of significance since the p-value is less than 0.05. Therefore it shows that there is a relationship between employee satisfaction and distance.

Table 4.23. Model fitting Information for the model between Employee Satisfaction and Distance to Work Location

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	64.730			
Final	58.400	6.331	3	.097

Table 4.24. Parameter estimates for the model between Employee Satisfaction and Distance to Work Location

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-2.998	.373	64.631	1	.000	-3.728	-2.267
	[Employee Satisfaction = 2]	-1.851	.283	42.845	1	.000	-2.406	-1.297
	[Employee Satisfaction = 3]	-.899	.252	12.717	1	.000	-1.394	-.405
	[Employee Satisfaction = 4]	2.058	.293	49.222	1	.000	1.483	2.633
Location	[Distance=1]	.406	.324	1.571	1	.210	-.229	1.041
	[Distance=2]	-.317	.352	.811	1	.368	-1.007	.373
	[Distance=3]	-.520	.519	1.007	1	.316	-1.537	.496
	[Distance=4]	0[a]	.	.	0	.	.	.

Results of the ordinal regression are given in Tables 4.23 and 4.24. According to Table 4.23, model is not significant at 5% level of significance. Table 4.24 also shows that parameters estimates are insignificant. Although chi squared test shows that there is an association between the 2 variables, this variable cannot be used to explain a considerable amount of variation from the variation of the employee satisfaction.

Except the demographic factors discussed above, all the other factors were insignificant with the employee satisfaction.

4.3 Regression Analysis on Demographic Factors and Employee Satisfaction

4.3.1 Ordinal logistic regression analysis on demographic factors and employee satisfaction

Ordinal regression is a statistical technique developed for analyzing ordinal outcomes. Ordinal data is analyzed by assigning values to the categories (Susan C. Scott, 1997).

The applications of ordinal regression are reviewed in section 2.1. Almost all the researches are satisfaction surveys. Therefore ordinal regression is well apposite to model the employee satisfaction. Being a suitable method in predicting the employee satisfaction (Which is an ordinal variable), ordinal regression analysis is used to analyze demographic factors and the employee satisfaction.

Demographic information is analyzed with the dependent variable. In here, dependent variable Employee satisfaction is measured with 6 variables. Since the model is getting complex with several dependent variables, each dependent variable was tested with the demographic factors. When the employee satisfaction is measured, it is measured using 6 questions. First question measures whether the employee is satisfied with the salary or not.

When all the demographic factors are tested against the first dependent variable, except the sector all the other variables were insignificant. Therefore it can be seen that, for the satisfaction of salary the main factor it is going to affect is salary.

Secondly, all the demographic factors are tested against the second dependent variable. Second dependent variable measures the satisfaction of the leave. When the ordinal logistic regression is used to test all the demographic factors, except the "distanceToWork", all the other variables were significant.

In the fifth question, it measures whether the employee is going to stay with the university/institute, although slightly higher payment is given elsewhere. When the ordinal logistic regression is used to test this dependent variable with the other demographic factors, except number of research papers and age all the variables were significant.

In the sixth question, it asks from the employee whether he/she is going to recommend this institute/university for another person. When the ordinal regression is applied to regress demographic factors and this variable, except sector all the other variables were insignificant.

In all the regression techniques, only one dependent categorical variable can be used. Therefore in order to combine all the 6 dependent variables, mode of the 6 responses was considered. Then mode was considered as the dependent variable. When this is regressed against the demographic factors using ordinal regression, sector and salary were significant. The resulting tables are as follows.

Table 4.29. Model Fitting Information for the model between Employee Satisfaction, sector and salary

Model	-2 Log Likelihood	Chi-Square Value	Degrees of Freedom	Significance
Intercept Only	148.895			
Final	114.342	34.553	5	.000

Table 4.29 gives the model fitting information and model is significant because p-value is 0.000 and it is less than 0.05. Therefore we have evidence to say that the model is significant.

Table 4.30. Goodness of fit Test Results for the model between Employee Satisfaction, sector and salary

	Chi-Square	Degrees of Freedom	Significance
Pearson	35.997	31	.246
Deviance	35.275	31	.273

According to Table 4.30, the significance values of the pearson and deviance values are more than 0.05. Therefore it implies that the model fits the data. Therefore data has become consistent with the model.

Table 4.31. Pseudo R – Square for the model between Employee Satisfaction, sector and salary

Cox and Snell	.141
Nagelkerke	.155
McFadden	.063

Table 4.31 gives pseudo R-square values for the model. Cox and Snell R – square is 0.141 and Nagelkerke R square is 0.155. This value shows the percentage of variation of the dependent variable described by the predictors. It is around 15% and the reason behind that could be having just 2 predictors (sector and salary) in the model.

Table 4.32. Parameter Estimates for the model between Employee Satisfaction, sector and salary

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-4.165	.620	45.054	1	.000	-5.381	-2.949
	[Employee Satisfaction = 2]	-2.965	.564	27.588	1	.000	-4.071	-1.858
	[Employee Satisfaction = 3]	-1.918	.540	12.609	1	.000	-2.977	-.859
	[Employee Satisfaction = 4]	1.327	.532	6.223	1	.013	.284	2.370
Location	[Sector=1]	-1.139	.293	15.066	1	.000	-1.714	-.564
	[Sector=2]	0[a]	.	.	0	.	.	.
	[Salary=1]	-1.570	.652	5.800	1	.016	-2.848	-.292
	[Salary=2]	-.719	.552	1.699	1	.192	-1.801	.362
	[Salary=3]	.068	.567	.015	1	.904	-1.043	1.179
	[Salary=4]	-.591	.635	.865	1	.352	-1.835	.654
	[Salary=5]	0[a]	.	.	0	.	.	.

Table 4.32 gives the parameter estimates of the model and their significance. According to the results, all the categories of sector have become significant. But from the salary, only the lowest category has become significant. For the lowest category of salary, p-value is 0.016 and it is less than 0.05. Therefore it is significant.

Predicted probabilities for this model can be calculated by the following formula.

$$P(EmployeeSatisfaction\ = 4) = \frac{1}{(1 + e^{-(1.327 - 1.139*(\text{sector}=1) - 1.570*(\text{salary}=1))})}$$

$$P(EmployeeSatisfaction \geq 3) = \frac{1}{(1 + e^{-(-1.918 - 1.139*(\text{sector}=1) - 1.570*(\text{salary}=1))})}$$

$$P(EmployeeSatisfaction \geq 2) = \frac{1}{(1 + e^{-(-2.965 - 1.139*(\text{sector}=1) - 1.570*(\text{salary}=1))})}$$

$$P(EmployeeSatisfaction \geq 1) = \frac{1}{(1 + e^{-(-4.165 - 1.139*(\text{sector}=1) - 1.570*(\text{salary}=1))})}$$

According to the above results, the probabilities of employee satisfaction can be calculated as follows. Assume that Employee Satisfaction is denoted by ES.

$P(ES = 3) = P(ES \geq 3) - P(ES = 4)$

$P(ES = 2) = P(ES \geq 2) - P(ES = 3) - P(ES = 4)$

$P(ES = 1) = P(ES \geq 1) - P(ES = 3) - P(ES = 4) - P(ES = 2)$

Table 4.33. Results of the Test of Parallel lines for the model between Employee Satisfaction, sector and salary

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Null Hypothesis	114.342			
General	93.058	21.284	15	.128

Table 4.33 gives the results of test of parallel lines. According to the results of the Test of parallel lines, p-value is 0.128 and it is greater than 0.05 which indicates that, proportional odds assumption is correct.

4.3.2 Multinomial logistic regression analysis on demographic factors and employee satisfaction

Multinomial logistic regression is also used to model ordinal response variables. Some of the researches that used the multinomial logistic regression are discussed in section 2.2. Almost all the researches discussed in 2.2 are related to satisfaction surveys.

When the dependent variable is an ordinal variable, multinomial logistic regression also can be applied. The same analysis discussed earlier can be done with the multinomial logistic regression. When the first dependent variable is regressed with the demographic factors, except sector and academic rank all the other variables were insignificant. But when the same variables were regressed with ordinal regression, sector was the only significant variable.

When the second dependent variable is regressed with the demographic factors, except "DistanceToWork" and "yearsOfService" all the other variables were significant.

When the third response variable is regressed with the demographic factors, except sector and number of research papers in refereed journals, all the other variables were insignificant.

When the fourth dependent variable is regressed with the demographic factors, all the variables were insignificant.

When the fifth response variable is modeled with the demographic factors, all the variables were insignificant except "DistanceToWorkLocation" and number of research papers.

Therefore most of the results obtained from ordinal regression are similar to the results obtained from multinomial logistic regression.

Table 4.34. Model Fitting Information for the model between employee Satisfaction and gender, salary, sector

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	207.804			
Final	139.256	68.548	24	.000

Table 4.34 gives the model fitting information. P- Value is 0.000 and it is less than 0.05. Therefore model is significant at 5% level of significance.

Table 4.35. Pseudo R-Square the model between employee Satisfaction and gender, salary, sector

Cox and Snell	.261
Nagelkerke	.286
McFadden	.125

According to Table 4.35, pseudo R-square values are 0.261 and 0.286. Therefore the model is explains 28.6% of the variation of the dependent variable.

Table 4.36. Likelihood Ratio Tests and Significance of the parameters

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	Degrees of Freedom	Significance
Intercept	139.256[a]	.000	0	.
Sector	156.528	17.272	4	.002
Salary	168.672	29.417	16	.021
Gender	149.908	10.652	4	.031

According to Table 4.36, all the predictors, sector, salary and gender are significant, because all are having p-values less than 0.05. In multinomial logistic regression also sector and salary have become significant same as in ordinal regression. Although gender is significant in the model, parameter estimates are insignificant. Therefore this is not a suitable model, though the R-square value is 28.6%.

Table 4.37. Correct Classification Rate of the model

Observed	Predicted					
	1	2	3	4	5	Percent Correct
1	0	0	1	10	0	0.0%
2	0	0	3	17	0	0.0%
3	0	0	6	28	0	17.6%
4	0	0	3	132	0	97.8%
5	0	0	0	27	0	0.0%
Overall Percentage	0.0%	0.0%	5.7%	94.3%	0.0%	60.8%

Table 4.37 gives the correct classification rate for the multinomial logistic regression model. According to the table, overall correct classification rate is 60.8%. Observed and predicted frequencies for the model are given in Appendix II. It can be observed that, for most of the categories, predicted and observed percentages are approximately

same. Pearson residuals are also included in this table and all those values are less than 2 and therefore the conclusion is model fits the data well.

4.3.3 Categorical regression analysis on demographic factors and employee satisfaction

When the demographic data is modeled with the employee satisfaction, the results obtained from categorical regression are given below.

Table 4.38. Model Summary of the Categorical Regression model

Multiple R	R Square	Adjusted R Square	Apparent Prediction Error
.404	.163	.140	.837

Table 4.38 gives the model summary and it gives the R square value. It is 0.163 and therefore these 3 variables, sector, gender and "distance to the work location" can explain only 16% of the variation from the variation of the dependent variable. The other demographic factors were insignificant in the model.

Table 4.39. ANOVA Table of Categorical Regression Model

	Sum of Squares	Degrees of Freedom	Mean Square	F-Value	Significance
Regression	36.968	6	6.161	7.133	.000
Residual	190.032	220	.864		
Total	227.000	226			

Table 4.39 illustrates the ANOVA table and the F-value is significant. P-value is less than 0.05 and therefore it can be concluded that, the model is significant.

Table 4.40. Parameter Estimates of Categorical Regression Model

	Standardized Coefficients		Degrees of Freedom	F- Value	Significance
	Beta	Bootstrap (1000) Estimate of Std. Error			
Gender	-.197	.053	2	13.621	.000
Sector	.294	.065	2	20.630	.000
Distance	-.162	.061	2	7.090	.001

Table 4.40 gives the parameter estimates in the second column and all the estimates are significant at 0.05 significance level. In the last column it gives the significance values of the variables and according to that all the values are less than 0.05. Therefore all the variables are significant. But R-square value for the model is 0.163 and it indicates that this model explains only 16.3% of the variation of the dependent variable. Model equation can be formulated as follows.

$$Transformed(EmployeeSatisfaction) = Transformed(Gender) * -0.197 + Transformed(Sector) * 0.294 + Transformed(Distance) * -0.162$$

These transformed variables can be calculated in SPSS. When a new record is given for the predictions, predictor variables should be transformed and then those values should be substituted to the model equation. Then the outcome variable can be calculated. Once it is retransformed, the value corresponding to Employee satisfaction can be calculated. As an example, assume gender is equal to 2, sector is equal to 2 and the distance is equal to 4. Then the corresponding transformed values are calculated from SPSS and those are 0.44, 0.72 and 0.83. To calculate the right hand side of the above equation, these values are substituted and the resulting value is -0.1345.

$$Transformed(EmployeeSatisfaction) = -0.1345$$

Then in order to find the Employee Satisfaction, this value is retransformed and the value obtained for Employee Satisfaction is 4.

Table 4.41. Correlations and Tolerance of the Model

	Correlations			Importance	Tolerance	
	Zero-Order	Partial	Part		After Transformation	Before Transformation
Gender	-.237	-.208	-.195	.287	.979	.979
Sector	.315	.303	.291	.569	.977	.963
Distance	-.145	-.174	-.162	.144	.998	.982

To interpret the independent variables of the regression model, regression coefficients, correlations, partial correlations and part correlations should be examined and all these information is given in Table 4.41.

The zero-order correlation represents the association between the transformed predictors and the transformed response. As can be seen from the table, the largest correlation occurs for the sector.

In the partial column it gives the partial correlations. For example, sector has a partial correlation of 0.303. Eliminating the effects of the other variables, freedom explains $(0.303)^2 = 0.0918 = 9.18\%$ of the variation in the employee satisfaction. Both gender and distance also describe some percentage of variance if the effects of the other variables are removed.

If the effects of gender and distance are removed from sector remaining part of sector explains $(–0.291)^2 = 0.0846 = 8.4\%$ of the variation in employee satisfaction.

The largest importance corresponds to sector accounting for 56.9% of the importance for this combination of predictors. Therefore that is the most important predictor variable out of all.

In Table 4.41, tolerance values are very high and are close to 1. Therefore independent variables are not predicted by the other independent variables. Thus it can be concluded that multicollinearity is not present. Thus all these evidence confirms that the model fits the data well.

All the models obtained from ordinal regression, multinomial logistic regression and categorical regression resulted in models with significant factors which were not correlated each other. Results obtained from the chi squared test confirms the fact that, multicollinearity is not present among the factors in the model.

4.4 Reliability Analysis

In order to analyze the main factors against the employee satisfaction, internal consistency of the factors should be tested with the chronbach’s alpha. Superior behavior, coworker behavior, physical environment, teaching and research, administrative duties, freedom and academic environment were tested for consistency.

The purpose of applying cronbach's alpha is to check the internal consistency. It is used when there are Likert scale questions in a questionnaire. Therefore in this analysis, chronbach's alpha is used to measure the reliability of the above 8 factors. There are altogether 47 questions in order to measure these 8 factors.

In many researches, it has used chronbach's alpha to measure the reliability. (ZihniEyupoglu, 2009) Has used reliability analysis to test for internal consistency of the items. Results of the reliability analysis are discussed below.

Table 4.42. Chronbach's Alpha for All the factors

Factor	**Chronbach's Alpha**	**Number of Questions**
Supervisor Behavior	-0.714	5
Co-Worker's Behavior	0.797	3
Job Itself	0.767	4
Physical Conditions	0.744	8
Teaching and Research	0.637	4
Administrative Duties	0.781	2
Academic Environment	0.254	8
Freedom	0.434	3

According to Table 4.42, except supervisor behavior all the other factors are having a positive chronbach's alpha value. To measure Supervisor behavior there are 5 questions and there are negatively related questions and that can be the reason to obtain negative values for the chronbach's alpha. Therefore to overcome this problem two questions from supervisor behavior were re-coded.

Table 4.43. Recoded Questions in Superior Behavior

Question	**Re-coded/ Not Re-coded**
Q11	Re-coded (1-5 values were replaced with 5-1 values)
Q12	Not Re-coded
Q13	Re-coded (1-5 values were replaced with 5-1 values)
Q14	Not Re-coded
Q15	Not Re-coded

Once the first and third questions are recoded, chronbach's alpha was again calculated and the resulting value was 0.812 which is an acceptable value. It indicates that, now the items in superior behavior are internally consistent.

4.5 Analysis of the Main Factors

This section includes the analysis of the main factors in the questionnaire; Superior behavior, co-worker behavior, job itself, physical conditions, teaching and research, administrative duties, academic environment and freedom which were extracted from (Rajapakshe, 2007). Primarily, it is going to analyze all the above factors individually with respect to employee satisfaction.

4.5.1 Superior behavior

Superior behavior is tested with the employee satisfaction using 3 different regression analysis techniques. Three methods resulted in three different models.

According to the Table 4.44, ordinal regression and multinomial logistic regression both resulted in somewhat similar results while categorical regression gave a different outcome. Ordinal regression and multinomial logistic regression both resulted in the same model and in this model only two items were significant and the model obtained from categorical regression has three significant factors.

Table 4.44. Significant items in Superior behavior

Question	**Ordinal Regression**	**Multinomial Logistic Regression**	**Categorical Regression**
Q11	Not Significant	Not Significant	Significant
Q12	Significant	Significant	Significant
Q13	Significant	Significant	Significant
Q14	Not Significant	Not Significant	Not Significant
Q15	Not Significant	Not Significant	Not Significant

4.5.2 Co-worker behavior

Table 4.45 gives the outcomes of the regression methods, when co-worker behavior is analyzed with the employee satisfaction.

Table 4.45. Significant items in Co-Worker behavior

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q21	Not Significant	Not Significant	Not Significant
Q22	Not Significant	Significant	Not Significant
Q23	Not Significant	Not Significant	Not Significant

As can be seen from the table 4.45, none of the items are significant in both methods ordinal regression and categorical regression. But in multinomial logistic regression, only one item became significant.

4.5.3 Job itself

When the items are tested with the three regression techniques, results are listed in the following table.

Table 4.46. Significance of the items in Job Itself

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q31	Significant	Significant	Not Significant
Q32	Significant	Significant	Significant
Q33	Not Significant	Not Significant	Not Significant
Q34	Not Significant	Not Significant	Not Significant

According to the Table 4.46, ordinal regression and multinomial logistic regression both has resulted in the same model. When the categorical regression is used, only one item was significant. Both items that are significant in table 49 are very important in measuring employee satisfaction. Because fitting the abilities and knowledge to the job is very crucial for a person’s job satisfaction. Further if a person can use his/her full potential in the job, which is also essential in employee satisfaction.

4.5.4 Physical conditions

Here it is tested the facilities provided by the university or institute such as transport services, medical insurance, Internet Access and etc. In order to determine the significant items 3 regression techniques were used and the results are as follows.

Table 4.47. Significance of the items in Physical Conditions

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q41	Not Significant	Not Significant	Not Significant
Q42	Not Significant	Not Significant	Not Significant
Q43	Not Significant	Not Significant	Not Significant
Q44	Significant	Significant	Significant
Q45	Not Significant	Not Significant	Not Significant
Q46	Not Significant	Not Significant	Not Significant
Q47	Significant	Significant	Significant
Q48	Not Significant	Not Significant	Not Significant

When all the three methods are used, only 2 items became significant. In here all three methods gave similar results. Therefore it seems that only Internet access and sport centers are significant out of all the facilities listed in the questionnaire.

4.5.5 Teaching and research

With this factor it is going to analyze impact of teaching and research on employee satisfaction. Results from the three regression techniques are stated in the following table.

Table 4.48. Significance of the items in Teaching and Research

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q51	Not Significant	Not Significant	Not Significant
Q52	Not Significant	Not Significant	Not Significant
Q53	Significant	Significant	Not Significant
Q54	Not Significant	Not Significant	Significant

As can be seen from the Table 4.48, ordinal regression and multinomial logistic regression both resulted in the same outcome whereas categorical regression gave a different result. Results indicate that, remaining time for academic studies has become significant.

4.5.6 Administrative duties

When the items in this factor are analyzed, Table 4.49 shows that, both items are not significant at 5% level. Therefore the questions included in the questionnaire for this factor were not significantly related to the employee satisfaction.

Table 4.49. Significance of the items in Administrative Duties

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q61	Not Significant	Not Significant	Not Significant
Q62	Not Significant	Not Significant	Not Significant

4.5.7 Academic environment

When the academic environment is analyzed with the three regression techniques, Table 4.50 shows the results obtained. Table 4.50 shows that, only one item has become significant out of all 8 items. Significant item is the awareness of the subjects that is going to teach. This has become significant in all three regression methods.

Table 4.50. Significance of the items in Academic Environment

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q71	Not Significant	Not Significant	Not Significant
Q72	Not Significant	Not Significant	Not Significant
Q73	Significant	Significant	Significant
Q74	Not Significant	Not Significant	Not Significant
Q75	Not Significant	Not Significant	Not Significant
Q76	Not Significant	Not Significant	Not Significant
Q77	Not Significant	Not Significant	Not Significant
Q78	Significant	Not Significant	Not Significant

4.5.8 Freedom

Table 4.51 shows the significant items of freedom when analyze with all three regression techniques. The most significant items are ability to get permission whenever needed and possibility of conducting lectures in other universities. Since it is concerned on the academics, freedom is an important factor which also confirms by the analysis.

Table 4.51. Significance of the items in Freedom

Question	Ordinal Regression	Multinomial Logistic Regression	Categorical Regression
Q81	Not Significant	Not Significant	Not Significant
Q82	Significant	Not Significant	Significant
Q83	Significant	Not Significant	Significant

4.6 Ordinal Regression Modelling for Employee Satisfaction

After analyzing all the factors individually with the three regression techniques, then it is going to have an overall analysis with all the factors. Initially it has listed down the results obtained from ordinal regression. Two models can be obtained by considering all these factors and those are explained in the following 2 sections.

4.6.1 Model I

All 37 items were included in the model and only few items were significant. In here 4 items were significant and resulting tables are given below.

Table 4.52 gives the model fitting information. It tests the following hypothesis.

H_0: Baseline-Intercept only model is significant
H_1: Final model is better than the baseline model

Table 4.52. Model Fitting Information for the Model I

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	446.080			
Final	376.785	69.295	16	.000

According to the table, the model is significant at 5% significance level. It compares the baseline model against the Final Model. Since the p-value is less than 0.05, it indicates that the final model is better than the baseline model. Therefore according to the table, model is significant at 5% level of significance.

Table 4.53. Goodness of fit Test Statistics for the Model I

	Chi-Square	Degrees of Freedom	Significance
Pearson	735.571	416	.000
Deviance	313.929	416	1.000

Table 4.53 gives the goodness of fit test statistics for the model I. Since this model has all the predictors as the categorical variables, above goodness-of-fit statistics cannot be used to evaluate the model as mentioned in section 3. Therefore pseudo R-square statistics are used to check the model adequacy.

Table 4.54. Pseudo R- Square values for the Model I

Cox and Snell	.261
Nagelkerke	.287
McFadden	.125

Table 4.54 gives the pseudo R-square values. According Nagelkerke statistic, predictors are able to explain 28.7% of the variation from the variation of the dependent variable. Cox and Snell statistic also gives a value 0.261 and it indicates that predictors can explain 26.1% of the variation of the dependent variable.

Table 4.55 gives the parameter estimates of the model and according to that, only 4 items are significant at 5% level. Following are the significant 4 questions out of all the questions.

Table 4.55. Parameter Estimates for the Model I

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	-5.511	.824	44.768	1	.000	-7.125	-3.897
	[Employee Satisfaction = 2]	-4.183	.774	29.216	1	.000	-5.700	-2.666
	[Employee Satisfaction = 3]	-3.053	.750	16.562	1	.000	-4.524	-1.583
	[Employee Satisfaction = 4]	.544	.711	.585	1	.444	-.850	1.938
Location	[Q13=1]	-2.072	.776	7.131	1	.008	-3.593	-.551
	[Q13=2]	.210	.574	.133	1	.715	-.916	1.335
	[Q13=3]	-.328	.511	.411	1	.522	-1.329	.674
	[Q13=4]	-.160	.489	.107	1	.744	-1.119	.799
	[Q13=5]	0[a]	.	.	0	.	.	.
	[Q31=1]	3.143	1.076	8.524	1	.004	1.033	5.253
	[Q31=2]	.067	.517	.017	1	.898	-.947	1.080
	[Q31=3]	.351	.560	.392	1	.531	-.747	1.448
	[Q31=4]	.492	.389	1.599	1	.206	-.271	1.256
	[Q31=5]	0[a]	.	.	0	.	.	.
	[Q32=1]	-3.111	1.053	8.736	1	.003	-5.174	-1.048
	[Q32=2]	-.782	.927	.711	1	.399	-2.599	1.035
	[Q32=3]	-1.874	.579	10.487	1	.001	-3.008	-.740
	[Q32=4]	-1.238	.356	12.072	1	.001	-1.937	-.540
	[Q32=5]	0[a]	.	.	0	.	.	.
	[Q83=1]	-3.318	.718	21.368	1	.000	-4.724	-1.911
	[Q83=2]	-1.827	.643	8.067	1	.005	-3.088	-.566
	[Q83=3]	-1.490	.612	5.935	1	.015	-2.688	-.291
	[Q83=4]	-.516	.578	.797	1	.372	-1.650	.617
	[Q83=5]	0[a]	.	.	0	.	.	.

Predicted probabilities can be calculated using the following formulas and SPSS software can be used to calculate them.

$$P(Employee\ Satisfaction\ =\ 4) = \frac{1}{1 + e^{-(0.544\ -2.0*(Q13=1)+3.1*(Q31=1)-3.1*(Q32=1)-1.9*(Q32=3)-1.2*(Q32=4)-3.3*(Q83=1)-1.8*(Q83=2)-1.5*(Q83=3)}}$$

$$P(Employee\ Satisfaction\ \geq\ 3) = \frac{1}{1 + e^{-(-3.053\ -2.0*(Q13=1)+3.1*(Q31=1) -3.1*(Q32=1)-1.9*(Q32=3)-1.2*(Q32=4)-3.3*(Q83=1)-1.8*(Q83=2)-1.5*(Q83=3)}}$$

$$P(Employee\ Satisfaction\ \geq\ 2) = \frac{1}{1 + e^{-(-4.183-2.0*(Q13=1)+3.1*(Q31=1) -3.1*(Q32=1)-1.9*(Q32=3)-1.2*(Q32=4)-3.3*(Q83=1)-1.8*(Q83=2)-1.5*(Q83=3)}}$$

$$P(Employee\ Satisfaction\ \geq\ 1) = \frac{1}{1 + e^{-(-5.511-2.0*(Q13=1)+3.1*(Q31=1) -3.1*(Q32=1)-1.9*(Q32=3)-1.2*(Q32=4)-3.3*(Q83=1)-1.8*(Q83=2)-1.5*(Q83=3)}}$$

According to the above results, the probabilities for Employee Satisfaction can be calculated as follows. Assume that Employee Satisfaction is denoted by ES.

$P(ES = 3) = P(ES \geq 3) - P(ES = 4)$

$P(ES = 2) = P(ES \geq 2) - P(ES = 3) - P(ES = 4)$

$P(ES = 1) = P(ES \geq 1) - P(ES = 3) - P(ES = 4) - P(ES = 2)$

Table 4.56. Test of parallel lines for Model I

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	376.785			
General	204.771[b]	172.014[c]	48	.000

Table 4.56 gives the output of the test of parallel lines for the model I and the significance value is less than 0.05. Therefore it indicates that proportional odds assumption is not accepted. The reason could be the large sample size in the dataset. Further, in order to check the model fit, residuals can be used and it is given in Appendix II. Almost all of the Pearson residuals are less than 2 and therefore the conclusion is that the model fits the data well.

Table 4.57. Significant Items in Model I

Question	**Main Factor**
Q13	Superior Behavior
Q31	Job Itself
Q32	Job Itself
Q83	Freedom

First item is an item from "superior behavior" and next two items are from "job itself". These 2 items measure how the job fits with the respondent's abilities and knowledge and how the respondent's full potential is utilized by the job. The last item is a measure of "freedom". It measures whether the respondent is allowed to give lectures in other universities. Therefore the overall idea is supervisor behavior; job itself and freedom are significant factors which affect the employee satisfaction.

4.6.2 Model II

Table 4.58. Model Fitting Information for the Model II

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	437.908			
Final	374.370	63.538	16	.000

H_0: Baseline-Intercept only model is significant

H_1: Final model is better than the baseline model

According to Table 4.58, the model is significant at 5% significance level, since the p-value is less than 0.05. It compares the intercept-only model and the final model. Since the chi square statistic is significant at 5% significance level, it indicates that null hypothesis is rejected. Therefore this model is significant at 5% level of significance.

Table 4.59. Goodness-of-fit statistics for Model II

	Chi-Square	Degrees of Freedom	Significance
Pearson	480.956	440	.087
Deviance	299.168	440	1.000

As mentioned above, here also to measure the goodness of fit, Pearson and Deviance statistics are not used and instead pseudo R-square is used.

Table 4.60. Pseudo R-square Values for Model II

Cox and Snell	.242
Nagelkerke	.266
McFadden	.115

According to Table 4.60, Nagelkerke R square is 0.266 and which indicates that this model can explain the 26.6% of variation from the variation of the dependent variable. This value is less than the same value of the previous model. By comparing R-square values of this model and the previous model, it can be concluded that first model is better than the second one.

Table 4.61. Parameter Estimates for Model II

		Estimate	Std. Error	Wald	Degrees of Freedom	Significance	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Employee Satisfaction = 1]	17.187	1.010	289.477	1	.000	15.207	19.166
	[Employee Satisfaction = 2]	18.501	.974	361.036	1	.000	16.592	20.409
	[Employee Satisfaction = 3]	19.615	.957	419.721	1	.000	17.739	21.492
	[Employee Satisfaction = 4]	23.089	.905	650.208	1	.000	21.314	24.864
Location	[Q47=1]	-2.475	.952	6.755	1	.009	-4.342	-.609
	[Q47=2]	-2.401	.869	7.634	1	.006	-4.103	-.698
	[Q47=3]	-1.907	.790	5.827	1	.016	-3.455	-.359
	[Q47=4]	-1.560	.797	3.834	1	.050	-3.121	.002
	[Q47=5]	0[a]	.	.	0	.	.	.
	[Q61=1]	21.352	2.335	83.642	1	.000	16.776	25.928
	[Q61=2]	.083	.427	.038	1	.846	-.754	.920
	[Q61=3]	.340	.440	.599	1	.439	-.522	1.202
	[Q61=4]	-.010	.373	.001	1	.978	-.742	.722
	[Q61=5]	0[a]	.	.	0	.	.	.
	[Q72=1]	23.539	.508	2145.717	1	.000	22.543	24.535
	[Q72=2]	23.835	.425	3152.315	1	.000	23.003	24.667
	[Q72=3]	23.875	.439	2957.245	1	.000	23.014	24.735
	[Q72=4]	23.647	.000	.	1	.	23.647	23.647
	[Q72=5]	0[a]	.	.	0	.	.	.
	[Q83=1]	-3.161	.741	18.177	1	.000	-4.614	-1.708
	[Q83=2]	-2.110	.640	10.857	1	.001	-3.365	-.855
	[Q83=3]	-1.730	.620	7.801	1	.005	-2.945	-.516
	[Q83=4]	-.703	.578	1.477	1	.224	-1.836	.431
	[Q83=5]	0[a]	.	.	0	.	.	.

Predicted probabilities can be calculated using the following formulas.

$P(Employee\text{ Satisfaction} = 4) =$

$$\frac{1}{1+e^{-(23.089-2.475*(Q47=1)-2.401*(Q47=2)-1.907*(Q47=3)+21.352*(Q61=1)+23.539*(Q72=1)+23.835*(Q72=2)+23.875*(Q72=3)+23.647*(Q72=4)-3.161*(Q83=1)-2.11*(Q83=2)-1.73*(Q83=3)(Q83=4)}}$$

$P(Employee$ Satisfaction $\geq 3)$ =

$$\frac{1}{1+e^{-(19.615\ -2.475*(Q47=1)-2.401*(Q47=2)-1.907*(Q47=3)+21.352*(Q61=1) +23.539*(Q72=1)+23.835*(Q72=2)+23.875*(Q72=3)+23.647*(Q72=4)-3.161*(Q83=1)-2.11*(Q83=2)-1.73*(Q83=3)(Q83=4)}}$$

$P(Employee$ Satisfaction $\geq 2)$ =

$$\frac{1}{1+e^{-(18.501\ -2.475*(Q47=1)-2.401*(Q47=2)-1.907*(Q47=3)+21.352*(Q61=1) +23.539*(Q72=1)+23.835*(Q72=2)+23.875*(Q72=3)+23.647*(Q72=4)-3.161*(Q83=1)-2.11*(Q83=2)-1.73*(Q83=3)(Q83=4)}}$$

$P(Employee$ Satisfaction $\geq 1)$ =

$$\frac{1}{1+e^{-(17.187\ -2.475*(Q47=1)-2.401*(Q47=2)-1.907*(Q47=3)+21.352*(Q61=1) +23.539*(Q72=1)+23.835*(Q72=2)+23.875*(Q72=3)+23.647*(Q72=4)-3.161*(Q83=1)-2.11*(Q83=2)-1.73*(Q83=3)(Q83=4)}}$$

According to the above results, the probabilities can be calculated as follows. Assume that Employee Satisfaction is denoted by ES.

$P(ES = 3) = P(ES \geq 3) - P(ES = 4)$

$P(ES = 2) = P(ES \geq 2) - P(ES = 3) - P(ES = 4)$

$P(ES = 1) = P(ES \geq 1) - P(ES = 3) - P(ES = 4) - P(ES = 2)$

According to Table 4.61, there are 4 items which are significant at 5% significance level. The 4 significant questions are given in table 4.60.

Table 4.62. Test of Parallel lines for Model II

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	374.370			
General	283.240[b]	91.130[c]	48	.000

Table 4.62 gives the output of the test of parallel lines for the model II and the significance value is less than 0.05 which indicates that proportional odds assumption is violated. As in model I, here also proportional odds assumption is not accepted due to the large sample size.

Further, in order to check the model fit, residuals can be used and it is given in Appendix II. Almost all of the Pearson residuals are less than 2 and therefore it can be concluded that model fits the data well.

Table 4.63. Significant items in Model II

Question	Main Factor
Q47	Physical Conditions/ Working Experience
Q61	Administrative Duties
Q72	Job Itself
Q83	Freedom

First item measures physical environment of the university or the institute. Second item measures whether the respondent has interference from the non-academic activities. Third one measures the academic environment and specifically, it evaluates whether the respondent's problems are solved immediately in the university. The last significant item evaluates the freedom of the respondent and it measures whether the respondent is allowed to give lectures in other universities.

4.7 Multinomial Logistic Regression Modeling for Employee Satisfaction

When the multinomial logistic regression is applied to analyze main factors in the questionnaire, following are the results obtained.

Table 4.64. Model Fitting Information for the model

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square value	Degrees of Freedom	Significance
Intercept Only	546.766			
Final	242.053	304.713	128	.000

Table 4.64 gives the model fitting information for the multinomial logistic regression model. It gives the -2 log – likelihood values for the baseline model and final model. Chi square value is calculated by getting the difference between -2 log-likelihood values. Significance value for this chi square value is 0.000 and it is less than 0.05. Therefore it indicates that the model is significant at 5% level of significance.

Table 4.65. Pseudo R-Square values for the model

Cox and Snell	.739
Nagelkerke	.811
McFadden	.556

Table 4.65 gives the pseudo R-square values for the model. According to the table, cox and snell R-square value is 0.739 and it indicates that, the model is explaining 73.9% of the variation of the dependent variable. Nagelkerke R-square value is 0.811 and it indicates that the model explains 81.1% of the variation of the dependent variable. This is the best R-square value obtained out of several significant models.

Table 4.61 gives all the significant factors. All the significance values in the table are less than 0.05 and therefore they are all significant at 5% level of significance. All these significant factors can be given in the following table.

Table 4.66. Likelihood Ratio Tests for the model

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	Degrees of Freedom	Significance
Intercept	242.053[a]	.000	0	.
Q12	298.486[b]	56.432	16	.000
Q32	294.279[b]	52.226	16	.000
Q44	289.221	47.168	16	.000
Q83	305.145[b]	63.092	16	.000
Q54	281.679[b]	39.626	16	.001
Q31	275.767[b]	33.714	16	.006
Q14	271.181[b]	29.128	16	.023
Q75	269.619[b]	27.565	16	.036

Table 4.66 gives the significant items in the questionnaire. According to that, significant factors are from superior behavior, job itself, physical environment, teaching and research, academic environment and freedom. Although these factors are significant, parameter estimates are insignificant. Therefore model is not acceptable.

Table 4.67. Correct Classification Rate for Multinomial logistic regression model

Observed	Predicted					
	1	2	3	4	5	Percent Correct
1	11	0	0	0	0	100.0%
2	0	10	0	8	2	50.0%
3	0	0	21	12	1	61.8%
4	0	5	4	122	4	90.4%
5	0	3	0	7	17	63.0%
Overall Percentage	4.8%	7.9%	11.0%	65.6%	10.6%	79.7%

Table 4.67 gives the percentage of the data values predicted correctly by the model. According to the table, overall correctly predicted percentage is 79.7%. This indicates that, 79.7% of the data is correctly predicted by this multinomial logistic regression model.

Table 4.68. Significant items in the questionnaire

Question	**Factor**
Q12	Superior Behavior
Q14	Superior Behavior
Q32	Job Itself
Q31	Job Itself
Q44	Physical Environment
Q54	Teaching and Research
Q75	Academic Environment
Q83	Freedom

4.8 Categorical Regression Model for Employee Satisfaction

Categorical regression is applied with the optimal scaling and the results obtained are given below.

Table 4.69. Model Summary for the categorical Regression Model

Multiple R	R Square	Adjusted R Square	Apparent Prediction Error
.503	.253	.226	.747

Table 4.69 gives the model summary and R square value is also given. R square value is 0.253 and it indicates that this model descrribes the 25.3% of the variation of the dependent variable.

Table 4.70 gives the ANOVA table and the hypothesis underlying that is as follows.

H_0 : The model is not significant

H_1 : The model is significant

Table 4.70. ANOVA Table for categorical Regression Model

	Sum of Squares	Degrees of Freedom	Mean Square	F- Value	Significance
Regression	57.914	8	7.239	9.309	.000
Residual	171.086	220	.778		
Total	229.000	228			

Table 4.69 gives the ANOVA table obtained from the categorical regression output and the model has become significant. According to the F value, corresponding significant value is 0.000 and it is less than 0.05. Therefore H_0 is rejected at 5% level of significance.

Table 4.71. Coefficients Table for Categorical Regression Model

	Standardized Coefficients		Degrees of Freedom	F - Value	Significance
	Beta	Bootstrap (1000) Estimate of Std. Error			
Q83	.351	.083	3	17.916	.000
Q47	.205	.100	3	4.170	.007
Q77	.153	.084	2	3.305	.039

Table 4.71 gives the coefficients of the categorical regression model. Regression model can be formulated as follows.

$$\begin{aligned} Transformed(EmployeeSatisfaction) &= Transformed(Q83) * 0.351 + Transformed(Q47) * 0.205 \\ &+ Transformed(Q77) * 0.153 \end{aligned}$$

Above transformed variables can be calculated with SPSS. When a new record is given, the values of the independent variables are transformed substituted to the above equation. Then the outcome is calculated and it is retransformed to find the outcome of the Employee Satisfaction.

For example, assume Q47 is 3, Q77 is 2 and Q83 is 3. Then the equivalent transformed values are obtained from SPSS and those are 0.41, -0.01 and 0.32. The right hand side of the above equation is computed by substituting the values and then 0.96.

$$Transformed(EmployeeSatisfaction) = 0.96$$

Then in order to find the Employee Satisfaction, this value is retransformed and the value obtained for Employee Satisfaction is 4.

According to the Table 4.71, only 3 questions are significant and they are given in Table 4.72.

Table 4.72. Correlations and Tolerance

	Correlations			Importance	Tolerance	
	Zero-Order	Partial	Part		After Transformation	Before Transformation
Q83	.433	.354	.327	.602	.865	.885
Q47	.350	.214	.190	.284	.857	.868
Q77	.190	.173	.152	.115	.989	.979
Dependent Variable: Employee Satisfaction						

Table 4.72 gives the correlations, partial correlations, part correlations, importance measures and tolerance values.

As can be seen from the table, the largest correlation occurs for the freedom (Q83). Freedom (Q83) has a partial correlation of 0.354. Removing the effects of the other variables, freedom explains $(0.354)^2 = 0.1253 = 12.53\%$ of the variation in the employee satisfaction. Both Q47 and Q77 also explain some portion of variance if the effects of the other variables are removed.

If the effects of Q47 and Q77 are removed from Q83 remaining part of freedom (Q83) explains $(0.327)^2 = 0.11 = 11\%$ of the variation in employee satisfaction.

The largest importance corresponds to Q83 accounting for 60.2% of the importance for this combination of predictors.

In Table 4.72, all of the tolerance measures are very high and are greater than 0.8. Therefore multicollinearity is not present between the variables. Thus all these evidence confirms that the model fits the data well.

Table 4.73. Significant Items in Categorical Regression Model

Question	**Main Factor**
Q47	Physical Conditions/ Working Experience
Q77	Academic Environment
Q83	Freedom

In this model, three items are significant and those are from the main factors Physical conditions, Academic environment and Freedom. Categorical regression model, shows that sports centers, research allowances and freedom are the significant items.

Comparison of the three models can be done using the following table.

Table 4.74. Comparison of the Models

Number	**Model**	**Significant Items**	**R- Square value (%)**
01	Ordinal Regrssion Model I	Q13, Q31, Q32, Q83	28.7
02	Ordinal Regression Model II	Q47, Q61, Q72, Q83	26.6
03	Multinomial Logistic Regression Model	Q12, Q14, Q31, Q32, Q44, Q54, Q75, Q83	81.1
04	Categorical Regression Model	Q83, Q47, Q77	25.3

According to table 4.74, multinomial logistic regression gives the model with highest R-square value that is 81.1%. However the parameter estimates of this model are not all significant. Thus this cannot be considered as an acceptable model. Therefore Model I explains the highest percentage of the variation of the response. This indicates that Model I is the best model out of these 4 models.

CHAPTER SUMMARY

In the analysis process, initially demographic factors were analyzed with pie charts, frequency tables. In order to check for the relationship among demographic factors and employee satisfaction, chi squared test and ordinal regression were used. Dependent variable, employee satisfaction is measured by 6 questions in the questionnaire and in order to form one variable, the mode of all 6 variables was taken. Each demographic factor was tested with the employee satisfaction using chi squared test. Results of the chi squared test have shown that, almost all the demographic factors are associated with the employee satisfaction. Ordinal regression was used to build a model between employee satisfaction and individual demographic factors. When all the demographic factors were individually tested with employee satisfaction, results have shown that gender and sector were significant factors while age and "distance to work location" were insignificant. Some categories of academic rank and salary were significant. Categories with lowest salary and lowest academic rank were significant. All the other categories of salary and academic rank were insignificant. Therefore results have shown that, academics with lower rank and lower salary were significant with the employee satisfaction. When ordinal regression, multinomial logistic regression and categorical regression were used to model the employee satisfaction, three different models were obtained and that can be shown in the Table 4.75.

Table 4.75. Summary of the Modeling for Demographic Factors

Regression Technique	**Significant Items**	**R-Square Value (%)**
Ordinal Regression	Sector, Salary	15.5
Multinomial Logistic Regression	Sector, Salary, Gender	28.6
Categorical Regression	Sector, Gender, Distance to Work Location	16.3

When the R-square values are compared, model obtained from the multinomial logistic regression gave the highest value, but all the parameter estimates were not significant. To test the goodness of fit, residuals, test of parallel lines and multicollinearity were also examined. After examining all these facts, the model obtained with ordinal regression was the appropriate model and it has shown that, sector and salary are the significant demographic factors.

Then the factors superior behavior, co-worker behavior, job itself, physical conditions, teaching and research, administrative duties, academic environment and freedom were analyzed. Initially all the factors were tested for consistency using the chronbach's alpha. For the superior behavior it was a negative value and therefore some of the questions were re-coded and then again chronbach's alpha was calculated and then the value was acceptable. Thereafter all the factors were tested with the employee satisfaction individually using different regression techniques. After doing the individual analysis, all the factors were tested together and four models were resulted and the summary is given in Table 4.74. Out of 4 models, 2 were ordinal regression models, one was a multinomial logistic regression model and one was a categorical regression model. When the models were compared with R-square values, model obtained from multinomial logistic regression gave the highest R-square value. But the parameter estimates were not significant. Therefore it is not a reliable model to predict the employee satisfaction. When the other three models were compared, Model I gave the highest R-square value. Thereafter in order to test the goodness of fit, residuals, test of parallel lines and multicollinearity were examined. Both models obtained from ordinal regression were significant with test of parallel lines and it implies that proportional odds assumption is violated. The reason behind this could be the large sample size in this dataset. After examining R-square values, residuals, test of parallel lines and multicollinearity, Model I is the appropriate model out of all four models. Therefore results have shown that, superior behavior, job itself and freedom are the significant factors for employee satisfaction. This confirms the results obtained in (Rajapakshe, 2007) .

CHAPTER 05
DISCUSSION AND CONCLUSIONS

5.1 Discussion

It was possible to achieve the objectives of this research with the use of different regression techniques. The main objective was to determine an appropriate statistical model in predicting the employee satisfaction of academics in Sri Lankan universities based on the factors included in the questionnaire. Ordinal regression, multinomial logistic regression and categorical regression were used to construct models for employee satisfaction.

Analysis of the main factors in the questionnaire resulted in four different models from the three regression techniques. According to the results, the best model out of the four models was obtained from ordinal regression. In the best model, superior behavior, job itself and freedom were significant factors. (Rajapakshe, 2007) Has found that co-worker's behavior, job itself and freedom are significant factors on employee satisfaction. Therefore it shows that there is a slight difference between the results of this study and the results of (Rajapakshe, 2007). But most of the significant factors in this study were much similar to (Rajapakshe, 2007).

The minor objective was identifying the demographic factors affecting employee satisfaction. When the demographic factors are analyzed with the employee satisfaction, sector, salary, gender and "distance to work location" were significant factors. As suggested by (David Bernal, 1998), this study also confirms that salary is related to employee satisfaction. (Shihadeh, 1994) Have found out of that, women are more satisfied with their job than men and that indicates that there is a relationship between employee satisfaction and gender. This study is able to confirm the result that employee satisfaction is associated with gender.

Therefore all the objectives of this study were achieved through the analysis process. In order to test the goodness of fit of the models, residuals and goodness of fit statistics were used.

5.2 Conclusion

Main objective of this study is to determine an appropriate statistical model to predict the employee satisfaction of academics in Sri Lanka. Different regression techniques have used in the analysis process to analyze demographic factors and all 7 factors namely superior behavior, co-worker behavior, job itself, physical conditions, teaching and Research, administrative duties, academic environment and freedom. All these 7 factors were measured by 37 questions included in the questionnaire. Results obtained from the analysis can be incorporated to improve the employee satisfaction of the Sri Lankan academics in future.

Findings obtained from the analysis indicated that, out of all the demographic factors, sector was a significant factor with all three regression techniques. When the demographic factors were regressed with the employee satisfaction, only 2 or 3 factors were significant in a one model. That could be due to multi co linearity effect present among the demographic factors. Using the three regression techniques, three models were obtained among employee satisfaction and demographic factors. The best suitable model was obtained from ordinal regression and according to that sector and salary can explain 15.5% of the variation of the employee satisfaction.

After analyzing the demographic factors, next step is analyzing all the main factors in the questionnaire. Before the analysis, internal consistency of each factor was tested with the chronbach's alpha and except the first factor (Superior behavior) all other factors gave positive values. When it is tested with superior behavior, it gave a negative value for chronbach's alpha and therefore in order to make it internally consistent two questions were re-coded and it resulted an acceptable chronbach's alpha value which shows that all 5 items in superior behavior are internally consistent. The factors academic environment and freedom were also not internally consistent and the chronbach's alpha values were less than 0.5.

Four models were obtained from ordinal regression, multinomial logistic regression and categorical regression among employee satisfaction and the main factors. Out of 4 models, 2 were ordinal regression models, one was a multinomial logistic regression model and one was a categorical regression model. When the models were compared with R-square values, model obtained from multinomial logistic regression gave the highest R-square value. But the parameter estimates were not significant. Therefore it is not a reliable model to predict the employee satisfaction. When the other three models were compared, Model I gave the highest R-square value. Thereafter in order to test the goodness of fit, residuals, test of parallel lines and multicollinearity were examined. Both models obtained from ordinal regression were significant with test of parallel lines and it shows that proportional odds assumption is violated. But here the rejection of the proportional odds assumption implies that the sample size is large in the dataset. After examining R-square values, residuals, test of parallel lines and multicollinearity, Model I is the appropriate model out of all four models. Therefore results have shown that, superior behavior, job itself and freedom are the significant factors for employee satisfaction. This confirms the results obtained in (Rajapakshe, 2007) .

5.3 Limitations of the Study

The analysis and the results were subject to several limitations.

- Several Dependent Variables

  This questionnaire includes six questions to measure the employee satisfaction. It is not possible to obtain a model by considering all these six variables as dependent variables. When there are several continuous dependent variables, it is possible to model data with MANOVA. But when there are qualitative dependent variables, it does not exist such a model. This is a limitation of this analysis.

5.4 Further Research

This research identifies superior behavior, freedom and job itself as the significant factors. But this model is explaining only 28.6% of the variation of the employee satisfaction. Therefore another researcher can explore the other possible factors which would affect the employee satisfaction of academics. When the questionnaire is analyzed, factor analysis also can be applied as a dimension reduction technique.

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Appendix I: Questionnaire

All the questions are about your opinions. So, please answer them yourself without consulting anyone. If any of the questions are unclear to you, please consult me (nilushi.d@sliit.lk). **PLEASE ANSWER ALL THE QUESTIONS BY PUTTING A (√) TICK IN ONE BOX.**

1. Age :
   - ☐ below 30
   - ☐ 30 – 39
   - ☐ 40 - 49
   - ☐ 50 - 59
   - ☐ over 60

2. Gender: ☐ Male ☐ Female

3. Academic Rank:
   - ☐ Assistant Lecturer
   - ☐ Lecturer
   - ☐ Senior Lecturer
   - ☐ Assistant Professor
   - ☐ Associate Professor
   - ☐ Professor

4. Sector: ☐ Private ☐ Government

5. Field of Lecturing (Eg: IT, Mathematics, Bio Science, etc.) :
…………………………………………….

6. Years of service in current University:
   - ☐ Below 5 Years
   - ☐ 5 – 10 Years
   - ☐ 11 – 15 Years
   - ☐ 16 – 20 Years
   - ☐ More than 20 Years

7. Salary:
   - ☐ Less than 50000
   - ☐ 50000 – 100000
   - ☐ 100000 – 150000
   - ☐ 150000 - 200000
   - ☐ More than 200000

8. Distance to work location from your current residence:
   - ☐ Less than 10km
   - ☐ 11km – 20km
   - ☐ 21km – 30km
   - ☐ More than 30km

9. Number of research articles published in refereed journals
   - ☐ None
   - ☐ 1 - 5
   - ☐ 6 - 10
   - ☐ More than 10

10. Number of research articles published in non - refereed journals

☐ None ☐ 6 - 10

☐ 1 - 5 ☐ More than 10

Supervision/ Superior Behavior

	5	4	3	2	1
11. I believe that my superior is honest	☐	☐	☐	☐	☐
12. I believe that my superior is selfish	☐	☐	☐	☐	☐
13. I have no doubt that my superior is going to support me in every condition	☐	☐	☐	☐	☐
14. My superiors' behaviors and manners annoy me	☐	☐	☐	☐	☐
15. Most of the activities contribute to the personal objectives of my superiors	☐	☐	☐	☐	☐

Co-workers' Behavior

	5	4	3	2	1
21. I can do collective work with my co-workers	☐	☐	☐	☐	☐
22. My co-workers help me when I have a problem	☐	☐	☐	☐	☐
23. I have good relations with my co-workers	☐	☐	☐	☐	☐

Job Itself

	5	4	3	2	1
31. I can use my full potential in my job	☐	☐	☐	☐	☐
32. My job fits my abilities and knowledge	☐	☐	☐	☐	☐
33. My job contributes to my personal development	☐	☐	☐	☐	☐
34. I can utilize my creativity in the job	☐	☐	☐	☐	☐

1= Strongly disagree

2=Disagree

3=Neutral

4 =Agree

5 =strongly Agree

Physical Conditions/ Working Experience

	5	4	3	2	1
41. Canteen services	☐	☐	☐	☐	☐
42. Medical services	☐	☐	☐	☐	☐
43. Transportation	☐	☐	☐	☐	☐
44. Internet access	☐	☐	☐	☐	☐
45. Photocopy and printer amenities	☐	☐	☐	☐	☐
46. Your Office	☐	☐	☐	☐	☐
47. Sport centers	☐	☐	☐	☐	☐
48. Library services	☐	☐	☐	☐	☐

1= Strongly dissatisfied

2=Dissatisfied

3=Neutral

4= Satisfied

5= strongly satisfied

Teaching and Research

	5	4	3	2	1
51. My lecture schedule is very busy	☐	☐	☐	☐	☐
52. I have to give lectures, which are out of my expertise	☐	☐	☐	☐	☐
53. I have no time for my academic studies	☐	☐	☐	☐	☐
54. The credit for my scientific studies is taken by others	☐	☐	☐	☐	☐

Administrative Duties

	5	4	3	2	1
61. Non-academic activities are taking so much time	☐	☐	☐	☐	☐
62. I am doing an administrative job that I don't want to.	☐	☐	☐	☐	☐

1= Strongly disagree

2=Disagree

3=Neutral

4 =Agree

5 =strongly Agree

Academic Environment

	5	4	3	2	1
71. There is a merit promotion system in my university	☐	☐	☐	☐	☐
72. The problems of academics are solved immediately in my university	☐	☐	☐	☐	☐
73. I am informed about all subjects which are relevant to me	☐	☐	☐	☐	☐
74. I believe that my university is a respected one among others	☐	☐	☐	☐	☐
75. The behaviors and manners of students dispirit my teaching	☐	☐	☐	☐	☐
76. My teaching performance is not appreciated	☐	☐	☐	☐	☐
77. My university sponsors all my research	☐	☐	☐	☐	☐
78. Being an academic is a second priority in my university	☐	☐	☐	☐	☐

Freedom

	5	4	3	2	1
81. I am free except for my lecture schedule	☐	☐	☐	☐	☐
82. I can get permission whenever I need	☐	☐	☐	☐	☐
83. I am allowed to give lectures in other Universities	☐	☐	☐	☐	☐

Employee Satisfaction

	5	4	3	2	1
91. I am satisfied with my salary	☐	☐	☐	☐	☐
92. I am satisfied with the leaves I have per year	☐	☐	☐	☐	☐
93. I am always enthusiastic to achieve my assigned tasks	☐	☐	☐	☐	☐

1= Strongly disagree

2=Disagree

3=Neutral

4 =Agree

5 =strongly Agree

94. I make personal sacrifices when required to help the university ☐ ☐ ☐ ☐ ☐

95. I would stay with my job even if offered a similar job elsewhere with slightly higher pay ☐ ☐ ☐ ☐ ☐

96. I can recommend anyone to join the institute/University. ☐ ☐ ☐ ☐ ☐

Appendix II: Residuals for the Models

Table 1. Residuals for the model between salary, Sector and Employee Satisfaction

Cell Information							
Frequency							
Salary	Sector		Employee Satisfaction				
			1	2	3	4	5
1	1	Observed	1	3	4	3	0
		Expected	2.081	2.721	2.767	3.241	.191
		Pearson Residual	-.832	.195	.857	-.159	-.441
	2	Observed	1	2	3	3	2
		Expected	.765	1.422	2.366	5.872	.575
		Pearson Residual	.279	.520	.465	-1.736	1.930
2	1	Observed	6	5	9	19	1
		Expected	3.623	6.318	9.457	19.013	1.589
		Pearson Residual	1.309	-.571	-.170	-.004	-.477
	2	Observed	2	2	4	39	4
		Expected	1.576	3.307	6.930	33.352	5.834
		Pearson Residual	.343	-.743	-1.197	1.663	-.807
3	1	Observed	0	3	2	8	4
		Expected	.737	1.486	2.875	10.485	1.417
		Pearson Residual	-.878	1.300	-.566	-1.240	2.267
	2	Observed	0	3	4	34	10
		Expected	.729	1.615	3.807	33.570	11.279
		Pearson Residual	-.860	1.108	.103	.127	-.431
4	1	Observed	1	0	2	1	0
		Expected	.322	.579	.910	2.009	.180
		Pearson Residual	1.246	-.823	1.299	-1.009	-.434
	2	Observed	0	1	2	21	2
		Expected	.709	1.505	3.233	17.222	3.331
		Pearson Residual	-.854	-.424	-.733	1.567	-.781
5	1	Observed	0	0	2	3	1
		Expected	.278	.555	1.054	3.644	.470
		Pearson Residual	-.540	-.782	1.015	-.538	.806
	2	Observed	0	1	2	4	3
		Expected	.153	.338	.790	6.623	2.096
		Pearson Residual	-.394	1.160	1.419	-1.754	.702
Link function: Logit.							

Table 2. Residuals for the multinomial logistic regression model between demographic factors and employee satisfaction

Observed and Predicted Frequencies								
Gender	Salary	Sector	Mode9	Frequency			Percentage	
				Observed	Predicted	Pearson Residual	Observed	Predicted
1	1	2	1	0	.000	.000	0.0%	0.0%
			2	0	.133	-.391	0.0%	13.3%
			3	1	.198	2.010	100.0%	19.8%
			4	0	.545	-1.095	0.0%	54.5%
			5	0	.123	-.375	0.0%	12.3%
	2	1	1	0	.000	.000	0.0%	0.0%
			2	0	.987	-1.041	0.0%	9.0%
			3	2	2.045	-.035	18.2%	18.6%
			4	8	7.531	.304	72.7%	68.5%
			5	1	.436	.871	9.1%	4.0%
		2	1	0	.000	.000	0.0%	0.0%
			2	0	.540	-.748	0.0%	3.4%
			3	2	1.045	.966	12.5%	6.5%
			4	13	13.528	-.365	81.3%	84.6%
			5	1	.886	.124	6.3%	5.5%
	3	1	1	0	.000	.000	0.0%	0.0%
			2	0	1.018	-1.080	0.0%	12.7%
			3	0	1.126	-1.145	0.0%	14.1%
			4	5	4.709	.209	62.5%	58.9%
			5	3	1.146	1.871	37.5%	14.3%
		2	1	0	.000	.000	0.0%	0.0%
			2	3	1.309	1.514	10.7%	4.7%
			3	1	1.352	-.311	3.6%	4.8%
			4	20	19.869	.055	71.4%	71.0%
			5	4	5.470	-.701	14.3%	19.5%
	4	1	1	0	.000	.000	0.0%	0.0%
			2	0	.055	-.240	0.0%	5.5%
			3	1	.245	1.754	100.0%	24.5%
			4	0	.657	-1.383	0.0%	65.7%
			5	0	.043	-.213	0.0%	4.3%
		2	1	0	.000	.000	0.0%	0.0%
			2	1	.315	1.234	6.7%	2.1%
			3	1	1.322	-.293	6.7%	8.8%
			4	12	12.437	-.300	80.0%	82.9%

			5	1	.926	.079	6.7%	6.2%
	5	1	1	0	.000	.000	0.0%	0.0%
			2	0	.344	-.614	0.0%	8.6%
			3	0	1.470	-1.524	0.0%	36.7%
			4	3	1.484	1.569	75.0%	37.1%
			5	1	.702	.392	25.0%	17.5%
		2	1	0	.000	.000	0.0%	0.0%
			2	1	.299	1.305	12.5%	3.7%
			3	2	1.195	.799	25.0%	14.9%
			4	4	4.239	-.169	50.0%	53.0%
			5	1	2.267	-.994	12.5%	28.3%
2	1	1	1	1	1.487	-.429	9.1%	13.5%
			2	3	2.961	.027	27.3%	26.9%
			3	4	4.247	-.153	36.4%	38.6%
			4	3	1.752	1.029	27.3%	15.9%
			5	0	.553	-.763	0.0%	5.0%
		2	1	1	.513	.698	10.0%	5.1%
			2	2	1.906	.075	20.0%	19.1%
			3	2	2.555	-.402	20.0%	25.5%
			4	3	3.703	-.460	30.0%	37.0%
			5	2	1.323	.632	20.0%	13.2%
	2	1	1	6	6.011	-.005	20.7%	20.7%
			2	5	3.383	.935	17.2%	11.7%
			3	7	6.285	.322	24.1%	21.7%
			4	11	12.204	-.453	37.9%	42.1%
			5	0	1.117	-1.078	0.0%	3.9%
		2	1	2	1.989	.008	5.7%	5.7%
			2	2	2.089	-.064	5.7%	6.0%
			3	2	3.625	-.901	5.7%	10.4%
			4	26	24.737	.469	74.3%	70.7%
			5	3	2.561	.285	8.6%	7.3%
	3	1	1	0	.000	.000	0.0%	0.0%
			2	3	1.793	1.008	33.3%	19.9%
			3	2	1.778	.185	22.2%	19.8%
			4	3	3.921	-.619	33.3%	43.6%
			5	1	1.508	-.454	11.1%	16.8%
		2	1	0	.000	.000	0.0%	0.0%
			2	0	1.881	-1.431	0.0%	8.2%
			3	3	1.743	.991	13.0%	7.6%

			4	14	13.502	.211	60.9%	58.7%
			5	6	5.875	.060	26.1%	25.5%
	4	1	1	1	.502	.771	33.3%	16.7%
			2	0	.221	-.488	0.0%	7.4%
			3	1	.890	.139	33.3%	29.7%
			4	1	1.257	-.300	33.3%	41.9%
			5	0	.131	-.370	0.0%	4.4%
		2	1	0	.498	-.723	0.0%	4.5%
			2	0	.410	-.652	0.0%	3.7%
			3	1	1.542	-.471	9.1%	14.0%
			4	9	7.650	.885	81.8%	69.5%
			5	1	.900	.110	9.1%	8.2%
	5	1	1	0	.000	.000	0.0%	0.0%
			2	0	.238	-.520	0.0%	11.9%
			3	2	.913	1.544	100.0%	45.6%
			4	0	.486	-.801	0.0%	24.3%
			5	0	.363	-.666	0.0%	18.2%
		2	1	0	.000	.000	0.0%	0.0%
			2	0	.118	-.354	0.0%	5.9%
			3	0	.423	-.732	0.0%	21.1%
			4	0	.791	-1.144	0.0%	39.5%
			5	2	.668	1.996	100.0%	33.4%
The percentages are based on total observed frequencies in each subpopulation.								

Table 3. Residuals for the Model I (Ordinal Regression)

Cell Information									
Frequency									
Q13	Q31	Q32	Q83		Employee Satisfaction				
					1	2	3	4	5
1	1	1	2	Observed	0	1	0	0	0
				Expected	.162	.260	.271	.295	.012
				Pearson Residual	-.440	1.688	-.610	-.647	-.110
		3	1	Observed	0	1	0	0	0
				Expected	.199	.285	.260	.247	.009
				Pearson Residual	-.499	1.584	-.592	-.572	-.097
		5	5	Observed	0	0	0	0	2
				Expected	.003	.008	.021	.711	1.257
				Pearson Residual	-.053	-.088	-.147	-1.050	1.087
	2	2	3	Observed	0	0	0	1	0
				Expected	.226	.298	.249	.219	.008
				Pearson Residual	-.540	-.651	-.576	1.887	-.090
		5	1	Observed	1	0	0	0	0
				Expected	.453	.304	.149	.091	.003
				Pearson Residual	1.098	-.662	-.418	-.316	-.053
			4	Observed	0	0	0	1	0
				Expected	.048	.112	.211	.585	.045
				Pearson Residual	-.224	-.355	-.517	.842	-.216
	4	4	3	Observed	0	1	0	0	0
				Expected	.231	.300	.247	.214	.008
				Pearson Residual	-.548	1.527	-.573	-.522	-.088
			4	Observed	0	1	0	0	0
				Expected	.102	.198	.270	.410	.020
				Pearson Residual	-.337	2.014	-.608	-.834	-.144
	5	5	1	Observed	1	0	0	0	0
				Expected	.470	.300	.142	.085	.003
				Pearson Residual	1.062	-.655	-.407	-.306	-.051
			3	Observed	0	0	0	1	0
				Expected	.125	.225	.275	.359	.016
				Pearson Residual	-.377	-.539	-.616	1.335	-.128
			5	Observed	0	0	0	1	0
				Expected	.031	.077	.165	.659	.068
				Pearson Residual	-.179	-.289	-.444	.719	-.270
2	2	3	2	Observed	0	0	1	0	0
				Expected	.110	.209	.273	.390	.019

				Pearson Residual	-.352	-.513	1.633	-.799	-.137
		4	2	Observed	1	0	0	1	0
				Expected	.123	.274	.471	1.062	.069
				Pearson Residual	2.576	-.564	-.785	-.089	-.267
			3	Observed	0	0	1	1	0
				Expected	.090	.211	.407	1.197	.095
				Pearson Residual	-.306	-.486	1.041	-.284	-.316
			4	Observed	0	0	0	3	0
				Expected	.052	.136	.326	2.135	.351
				Pearson Residual	-.231	-.377	-.605	1.103	-.630
		5	4	Observed	0	0	0	0	1
				Expected	.005	.014	.038	.630	.313
				Pearson Residual	-.072	-.119	-.198	-1.305	1.480
	3	3	2	Observed	0	0	0	1	0
				Expected	.085	.175	.261	.454	.024
				Pearson Residual	-.306	-.461	-.595	1.097	-.158
		4	5	Observed	0	0	0	1	0
				Expected	.008	.021	.056	.687	.228
				Pearson Residual	-.089	-.147	-.243	.675	-.543
	4	3	5	Observed	0	1	0	0	0
				Expected	.013	.034	.085	.715	.152
				Pearson Residual	-.114	5.328	-.305	-1.585	-.424
		4	1	Observed	0	1	0	0	0
				Expected	.160	.258	.272	.298	.012
				Pearson Residual	-.437	1.695	-.611	-.651	-.111
			2	Observed	0	0	0	1	0
				Expected	.041	.098	.195	.614	.052
				Pearson Residual	-.207	-.330	-.491	.793	-.234
			3	Observed	0	0	2	1	0
				Expected	.089	.222	.480	1.996	.213
				Pearson Residual	-.303	-.489	2.395	-1.219	-.479
			4	Observed	0	0	0	2	1
				Expected	.034	.091	.232	2.137	.506
				Pearson Residual	-.186	-.307	-.501	-.175	.763
		5	4	Observed	0	0	0	1	0
				Expected	.003	.009	.025	.551	.411
				Pearson Residual	-.058	-.096	-.161	.903	-.836
			5	Observed	0	0	0	0	1
				Expected	.002	.006	.015	.438	.540

				Pearson Residual	-.045	-.074	-.125	-.882	.924
	5	4	2	Observed	0	0	1	0	0
				Expected	.066	.144	.241	.517	.032
				Pearson Residual	-.265	-.410	1.774	-1.035	-.183
			3	Observed	0	0	1	0	0
				Expected	.048	.111	.210	.586	.045
				Pearson Residual	-.224	-.354	1.938	-1.190	-.216
			4	Observed	0	0	0	1	0
				Expected	.019	.048	.114	.709	.110
				Pearson Residual	-.138	-.225	-.360	.641	-.352
		5	1	Observed	0	0	1	0	0
				Expected	.083	.171	.259	.461	.025
				Pearson Residual	-.301	-.455	1.690	-.925	-.161
			3	Observed	0	0	0	2	1
				Expected	.043	.113	.279	2.148	.417
				Pearson Residual	-.209	-.343	-.555	-.189	.973
			4	Observed	0	0	0	1	1
				Expected	.011	.030	.080	1.281	.599
				Pearson Residual	-.105	-.174	-.289	-.414	.620
			5	Observed	0	0	0	0	1
				Expected	.003	.009	.025	.546	.417
				Pearson Residual	-.057	-.095	-.159	-1.096	1.182
3	1	5	4	Observed	0	0	0	0	1
				Expected	.000	.001	.003	.143	.853
				Pearson Residual	-.020	-.034	-.057	-.408	.416
	2	1	4	Observed	0	1	0	0	0
				Expected	.165	.262	.271	.291	.012
				Pearson Residual	-.444	1.678	-.609	-.640	-.109
		2	1	Observed	0	1	0	0	0
				Expected	.240	.304	.243	.206	.007
				Pearson Residual	-.563	1.514	-.566	-.509	-.086
			4	Observed	0	1	0	0	0
				Expected	.019	.049	.116	.708	.109
				Pearson Residual	-.139	4.417	-.362	-1.557	-.349
		3	2	Observed	1	0	0	0	0
				Expected	.175	.270	.268	.276	.011
				Pearson Residual	2.169	-.608	-.605	-.618	-.105
			3	Observed	0	0	0	1	0
				Expected	.132	.232	.275	.346	.015

				Pearson Residual	-.389	-.550	-.616	1.376	-.124
		4	2	Observed	1	0	0	1	0
				Expected	.202	.394	.540	.823	.041
				Pearson Residual	1.871	-.700	-.860	.254	-.204
			4	Observed	0	0	0	3	0
				Expected	.088	.220	.477	2.000	.215
				Pearson Residual	-.302	-.487	-.753	1.225	-.482
			5	Observed	0	0	0	1	0
				Expected	.018	.046	.111	.711	.115
				Pearson Residual	-.135	-.220	-.353	.638	-.360
		5	2	Observed	0	0	0	1	0
				Expected	.032	.078	.166	.657	.067
				Pearson Residual	-.181	-.291	-.447	.722	-.268
	3	3	2	Observed	0	1	0	0	0
				Expected	.138	.238	.275	.334	.014
				Pearson Residual	-.400	1.787	-.616	-.709	-.121
		4	3	Observed	0	0	0	1	0
				Expected	.057	.129	.228	.549	.037
				Pearson Residual	-.246	-.384	-.544	.907	-.197
			4	Observed	0	0	1	2	0
				Expected	.067	.171	.394	2.089	.280
				Pearson Residual	-.262	-.426	1.037	-.112	-.555
			5	Observed	0	0	1	1	0
				Expected	.027	.071	.177	1.432	.294
				Pearson Residual	-.165	-.271	2.051	-.677	-.587
		5	4	Observed	0	0	0	1	0
				Expected	.007	.018	.047	.667	.262
				Pearson Residual	-.081	-.135	-.223	.707	-.595
	4	1	4	Observed	0	0	0	0	1
				Expected	.114	.213	.274	.381	.018
				Pearson Residual	-.359	-.520	-.614	-.785	7.413
		3	2	Observed	0	0	0	1	0
				Expected	.122	.222	.275	.365	.017
				Pearson Residual	-.373	-.534	-.615	1.319	-.130
		4	1	Observed	0	0	0	2	0
				Expected	.492	.611	.481	.401	.014
				Pearson Residual	-.808	-.939	-.795	2.822	-.120
			2	Observed	0	2	2	2	0
				Expected	.411	.892	1.469	3.043	.186

				Pearson Residual	-.664	1.272	.505	-.852	-.438
			3	Observed	0	1	1	7	0
				Expected	.449	1.038	1.932	5.196	.385
				Pearson Residual	-.687	-.040	-.756	1.217	-.635
			4	Observed	0	0	2	7	0
				Expected	.175	.451	1.065	6.356	.953
				Pearson Residual	-.422	-.689	.965	.471	-1.032
			5	Observed	0	1	0	0	0
				Expected	.012	.031	.079	.713	.166
				Pearson Residual	-.109	5.589	-.292	-1.577	-.445
		5	1	Observed	1	0	1	0	0
				Expected	.173	.353	.524	.902	.048
				Pearson Residual	2.081	-.655	.766	-1.282	-.223
			2	Observed	0	0	0	0	1
				Expected	.021	.054	.125	.702	.099
				Pearson Residual	-.146	-.238	-.378	-1.533	3.013
			3	Observed	0	0	0	2	1
				Expected	.045	.118	.290	2.147	.401
				Pearson Residual	-.214	-.350	-.566	-.188	1.016
			4	Observed	0	1	1	2	2
				Expected	.034	.093	.250	3.883	1.740
				Pearson Residual	-.186	2.997	1.533	-1.608	.234
	5	4	1	Observed	0	0	1	0	0
				Expected	.348	.320	.194	.134	.004
				Pearson Residual	-.731	-.686	2.041	-.393	-.066
			2	Observed	0	0	2	0	0
				Expected	.215	.410	.544	.794	.038
				Pearson Residual	-.490	-.718	2.314	-1.147	-.198
			4	Observed	0	0	0	1	0
				Expected	.031	.078	.166	.658	.067
				Pearson Residual	-.180	-.290	-.446	.721	-.269
		5	1	Observed	1	0	0	0	0
				Expected	.134	.235	.275	.341	.015
				Pearson Residual	2.542	-.554	-.616	-.720	-.123
			2	Observed	0	0	0	1	0
				Expected	.034	.083	.173	.648	.063
				Pearson Residual	-.187	-.300	-.458	.738	-.259
			3	Observed	0	0	0	1	1
				Expected	.049	.123	.279	1.377	.172

				Pearson Residual	-.223	-.362	-.569	-.576	2.085
			4	Observed	0	0	0	0	1
				Expected	.009	.025	.065	.701	.200
				Pearson Residual	-.097	-.160	-.263	-1.532	2.001
4	1	1	1	Observed	0	0	0	1	0
				Expected	.113	.211	.273	.385	.018
				Pearson Residual	-.356	-.517	-.613	1.264	-.136
			3	Observed	0	0	1	0	0
				Expected	.020	.051	.121	.705	.103
				Pearson Residual	-.143	-.233	2.697	-1.544	-.339
	2	2	4	Observed	0	0	0	2	0
				Expected	.032	.084	.203	1.429	.252
				Pearson Residual	-.180	-.295	-.476	.894	-.537
		3	4	Observed	0	0	0	2	0
				Expected	.092	.217	.414	1.185	.092
				Pearson Residual	-.311	-.493	-.722	1.173	-.311
		4	3	Observed	0	0	0	1	0
				Expected	.064	.140	.238	.524	.033
				Pearson Residual	-.261	-.404	-.559	.952	-.186
		5	4	Observed	0	0	0	1	0
				Expected	.007	.020	.053	.680	.240
				Pearson Residual	-.086	-.143	-.236	.686	-.562
			5	Observed	0	0	0	0	1
				Expected	.004	.012	.033	.605	.346
				Pearson Residual	-.067	-.110	-.184	-1.237	1.375
	3	2	2	Observed	0	0	0	1	0
				Expected	.043	.103	.200	.604	.049
				Pearson Residual	-.213	-.338	-.500	.809	-.227
		3	1	Observed	0	0	0	0	1
				Expected	.375	.319	.181	.121	.004
				Pearson Residual	-.775	-.684	-.471	-.371	15.995
			2	Observed	0	0	1	1	0
				Expected	.238	.437	.549	.741	.034
				Pearson Residual	-.520	-.748	.715	.379	-.186
			3	Observed	0	0	1	0	0
				Expected	.088	.179	.263	.446	.024
				Pearson Residual	-.311	-.467	1.674	-.898	-.156
			4	Observed	0	0	0	2	0
				Expected	.070	.171	.355	1.282	.121

				Pearson Residual	-.270	-.433	-.657	1.059	-.359
		4	2	Observed	0	0	0	1	0
				Expected	.067	.146	.243	.513	.032
				Pearson Residual	-.268	-.413	-.566	.975	-.181
			3	Observed	0	0	1	1	0
				Expected	.097	.226	.424	1.165	.088
				Pearson Residual	-.320	-.505	.996	-.236	-.303
			4	Observed	0	0	0	3	0
				Expected	.057	.147	.348	2.123	.325
				Pearson Residual	-.241	-.393	-.628	1.113	-.604
			5	Observed	0	0	0	1	0
				Expected	.011	.030	.077	.712	.169
				Pearson Residual	-.107	-.177	-.289	.636	-.451
		5	4	Observed	0	0	0	2	0
				Expected	.011	.030	.081	1.287	.591
				Pearson Residual	-.106	-.175	-.291	1.053	-.916
	4	3	1	Observed	1	0	0	0	0
				Expected	.343	.320	.196	.137	.004
				Pearson Residual	1.385	-.686	-.494	-.398	-.067
		4	1	Observed	0	0	1	0	0
				Expected	.216	.294	.253	.228	.008
				Pearson Residual	-.525	-.645	1.718	-.544	-.092
			2	Observed	0	0	0	5	0
				Expected	.293	.657	1.153	2.716	.182
				Pearson Residual	-.557	-.870	-1.224	2.051	-.435
			3	Observed	1	0	2	5	0
				Expected	.340	.807	1.583	4.869	.402
				Pearson Residual	1.158	-.947	.370	.095	-.651
			4	Observed	0	0	0	15	0
				Expected	.247	.645	1.563	10.703	1.843
				Pearson Residual	-.501	-.821	-1.321	2.454	-1.449
			5	Observed	0	0	0	2	0
				Expected	.020	.053	.136	1.411	.380
				Pearson Residual	-.141	-.233	-.383	.914	-.685
		5	3	Observed	1	0	1	0	1
				Expected	.038	.101	.253	2.145	.463
				Pearson Residual	4.961	-.323	1.553	-2.744	.858
			4	Observed	0	0	0	6	2
				Expected	.039	.105	.285	4.965	2.606

				Pearson Residual	-.197	-.327	-.544	.754	-.457
			5	Observed	0	0	0	1	0
				Expected	.003	.008	.022	.520	.447
				Pearson Residual	-.054	-.089	-.150	.961	-.900
	5	3	2	Observed	0	0	0	1	0
				Expected	.161	.259	.271	.296	.012
				Pearson Residual	-.438	-.591	-.610	1.541	-.111
		4	3	Observed	0	0	1	0	0
				Expected	.068	.147	.244	.510	.031
				Pearson Residual	-.269	-.416	1.761	-1.020	-.180
			4	Observed	0	0	1	1	0
				Expected	.053	.134	.298	1.357	.158
				Pearson Residual	-.234	-.379	1.396	-.541	-.414
		5	1	Observed	0	0	0	1	0
				Expected	.116	.215	.274	.378	.018
				Pearson Residual	-.362	-.523	-.614	1.283	-.134
			2	Observed	0	2	0	3	0
				Expected	.143	.357	.780	3.351	.369
				Pearson Residual	-.384	2.852	-.961	-.334	-.631
			3	Observed	0	0	2	0	0
				Expected	.041	.106	.247	1.405	.201
				Pearson Residual	-.205	-.334	3.765	-2.173	-.472
			4	Observed	0	0	1	7	1
				Expected	.071	.191	.502	6.184	2.052
				Pearson Residual	-.267	-.442	.723	.587	-.836
5	2	4	2	Observed	1	0	0	0	0
				Expected	.075	.159	.252	.486	.028
				Pearson Residual	3.512	-.435	-.581	-.971	-.170
	3	3	4	Observed	0	1	0	0	0
				Expected	.030	.075	.161	.664	.070
				Pearson Residual	-.176	3.517	-.439	-1.404	-.275
	4	3	4	Observed	0	0	1	0	0
				Expected	.026	.066	.147	.680	.080
				Pearson Residual	-.164	-.266	2.408	-1.459	-.295
		4	4	Observed	0	0	0	4	1
				Expected	.070	.185	.459	3.580	.706
				Pearson Residual	-.267	-.439	-.711	.417	.378
			5	Observed	0	0	0	0	1
				Expected	.008	.023	.059	.694	.216

				Pearson Residual	-.092	-.152	-.251	-1.505	1.906
		5	3	Observed	0	1	0	1	1
				Expected	.033	.087	.221	2.131	.529
				Pearson Residual	-.181	3.150	-.489	-1.439	.713
			4	Observed	0	0	0	0	1
				Expected	.004	.011	.031	.592	.362
				Pearson Residual	-.064	-.107	-.178	-1.205	1.328
	5	4	3	Observed	0	0	0	1	0
				Expected	.058	.131	.230	.544	.037
				Pearson Residual	-.249	-.388	-.547	.915	-.195
		5	1	Observed	0	1	0	0	1
				Expected	.201	.392	.539	.827	.041
				Pearson Residual	-.472	1.084	-.859	-1.188	4.773
			3	Observed	0	0	1	3	0
				Expected	.070	.183	.439	2.845	.463
				Pearson Residual	-.268	-.438	.897	.171	-.723
			4	Observed	0	0	0	3	1
				Expected	.027	.073	.194	2.678	1.029
				Pearson Residual	-.165	-.272	-.451	.343	-.033
Link function: Logit.									

Table 4. Residuals for the Model II

Cell Information									
Frequency									
Q47	Q61	Q72	Q83		Employee Satisfaction				
					1	2	3	4	5
1	2	2	3	Observed	0	1	0	0	0
				Expected	.074	.155	.246	.491	.033
				Pearson Residual	-.283	2.331	-.572	-.982	-.185
		4	5	Observed	0	0	0	1	0
				Expected	.017	.043	.103	.700	.138
				Pearson Residual	-.131	-.212	-.338	.655	-.399
	4	1	3	Observed	0	0	0	1	0
				Expected	.106	.200	.267	.405	.023
				Pearson Residual	-.344	-.499	-.604	1.213	-.152
			4	Observed	0	0	0	1	0
				Expected	.041	.095	.188	.615	.061
				Pearson Residual	-.206	-.325	-.481	.791	-.254
		3	2	Observed	1	0	0	0	0
				Expected	.110	.205	.269	.395	.022
				Pearson Residual	2.847	-.508	-.606	-.808	-.149
		4	1	Observed	0	0	0	1	0
				Expected	.307	.315	.212	.160	.006
				Pearson Residual	-.666	-.679	-.518	2.294	-.079
	5	1	1	Observed	2	1	0	0	0
				Expected	.985	.951	.606	.442	.017
				Pearson Residual	1.249	.061	-.871	-.720	-.130
			2	Observed	0	0	0	1	0
				Expected	.146	.243	.271	.325	.016
				Pearson Residual	-.413	-.566	-.610	1.443	-.126
			3	Observed	1	0	0	0	0
				Expected	.105	.198	.267	.407	.023
				Pearson Residual	2.925	-.498	-.603	-.829	-.153
		2	1	Observed	0	0	1	0	1
				Expected	.533	.617	.460	.375	.015
				Pearson Residual	-.853	-.944	.908	-.680	8.095
		3	4	Observed	0	0	0	1	0
				Expected	.029	.071	.153	.663	.084
				Pearson Residual	-.173	-.277	-.425	.713	-.302
2	2	2	4	Observed	0	0	0	1	0
				Expected	.026	.064	.142	.675	.093

				Pearson Residual	-.163	-.262	-.406	.694	-.321
		3	3	Observed	0	0	0	1	0
				Expected	.067	.143	.238	.516	.037
				Pearson Residual	-.267	-.409	-.558	.969	-.196
			4	Observed	0	0	0	1	0
				Expected	.025	.062	.138	.679	.097
				Pearson Residual	-.160	-.257	-.400	.688	-.327
	3	1	1	Observed	1	0	0	0	0
				Expected	.244	.302	.240	.206	.008
				Pearson Residual	1.761	-.657	-.562	-.510	-.092
		2	2	Observed	0	0	0	1	0
				Expected	.077	.161	.250	.481	.032
				Pearson Residual	-.290	-.437	-.577	1.039	-.180
			5	Observed	0	0	0	1	0
				Expected	.010	.026	.067	.685	.212
				Pearson Residual	-.101	-.165	-.268	.678	-.518
		3	2	Observed	0	0	2	0	0
				Expected	.149	.312	.494	.979	.066
				Pearson Residual	-.402	-.608	2.470	-1.385	-.260
			3	Observed	0	0	0	1	0
				Expected	.052	.118	.215	.568	.047
				Pearson Residual	-.235	-.366	-.523	.872	-.223
		4	3	Observed	0	0	0	1	0
				Expected	.065	.140	.235	.522	.038
				Pearson Residual	-.263	-.404	-.554	.957	-.199
	4	2	2	Observed	1	1	1	1	0
				Expected	.426	.803	1.070	1.611	.090
				Pearson Residual	.931	.246	-.080	-.623	-.303
		3	4	Observed	0	0	0	1	0
				Expected	.027	.067	.147	.670	.089
				Pearson Residual	-.167	-.268	-.415	.702	-.312
			5	Observed	0	0	0	0	1
				Expected	.014	.035	.087	.699	.164
				Pearson Residual	-.118	-.192	-.309	-1.526	2.254
	5	1	2	Observed	0	1	0	0	0
				Expected	.137	.234	.272	.340	.017
				Pearson Residual	-.398	1.808	-.611	-.718	-.131
			4	Observed	0	0	0	1	1
				Expected	.075	.178	.359	1.257	.132

				Pearson Residual	-.279	-.442	-.661	-.376	2.477
		2	1	Observed	1	0	0	0	0
				Expected	.252	.304	.236	.199	.008
				Pearson Residual	1.722	-.662	-.556	-.499	-.090
			4	Observed	0	0	0	1	0
				Expected	.028	.069	.150	.667	.086
				Pearson Residual	-.170	-.272	-.420	.707	-.308
			5	Observed	0	0	0	1	0
				Expected	.014	.036	.089	.700	.160
				Pearson Residual	-.120	-.194	-.313	.655	-.437
		3	1	Observed	0	0	1	0	0
				Expected	.245	.302	.239	.205	.008
				Pearson Residual	-.569	-.658	1.782	-.509	-.092
			4	Observed	0	0	1	0	0
				Expected	.027	.067	.146	.671	.090
				Pearson Residual	-.167	-.267	2.420	-1.428	-.314
		4	1	Observed	0	1	0	0	0
				Expected	.289	.313	.220	.171	.007
				Pearson Residual	-.638	1.481	-.531	-.455	-.082
3	1	2	1	Observed	0	0	0	0	1
				Expected	.000	.000	.000	.000	1.000
				Pearson Residual	.000	.000	.000	.000	.000
		4	4	Observed	0	0	0	0	1
				Expected	.000	.000	.000	.000	1.000
				Pearson Residual	.000	.000	.000	.000	.000
	2	1	2	Observed	0	0	1	1	0
				Expected	.164	.334	.507	.935	.060
				Pearson Residual	-.422	-.634	.801	.092	-.248
			3	Observed	0	1	0	1	0
				Expected	.115	.255	.448	1.097	.086
				Pearson Residual	-.349	1.580	-.760	-.138	-.300
			4	Observed	0	1	0	0	0
				Expected	.021	.054	.123	.690	.111
				Pearson Residual	-.148	4.198	-.375	-1.493	-.354
		2	2	Observed	0	0	0	3	0
				Expected	.186	.407	.694	1.594	.119
				Pearson Residual	-.446	-.686	-.950	1.627	-.352
			3	Observed	0	0	0	1	0
				Expected	.043	.101	.195	.604	.057

				Pearson Residual	-.213	-.335	-.493	.811	-.246
			4	Observed	0	0	0	2	0
				Expected	.032	.082	.197	1.401	.288
				Pearson Residual	-.180	-.292	-.467	.925	-.580
		3	1	Observed	1	0	0	0	0
				Expected	.154	.250	.270	.311	.015
				Pearson Residual	2.344	-.577	-.608	-.673	-.123
			3	Observed	0	0	1	1	0
				Expected	.083	.195	.382	1.221	.118
				Pearson Residual	-.295	-.465	1.110	-.320	-.354
			4	Observed	0	0	0	1	1
				Expected	.031	.079	.191	1.401	.298
				Pearson Residual	-.177	-.287	-.459	-.619	1.393
		4	1	Observed	0	0	0	1	0
				Expected	.186	.274	.262	.266	.012
				Pearson Residual	-.478	-.614	-.596	1.659	-.109
	3	2	1	Observed	0	0	1	0	0
				Expected	.128	.225	.272	.357	.018
				Pearson Residual	-.383	-.539	1.638	-.746	-.137
			3	Observed	0	0	0	1	0
				Expected	.034	.082	.169	.643	.072
				Pearson Residual	-.187	-.298	-.451	.745	-.279
			4	Observed	0	0	1	2	1
				Expected	.050	.129	.320	2.786	.716
				Pearson Residual	-.224	-.365	1.254	-.855	.371
			5	Observed	0	0	0	1	0
				Expected	.006	.016	.043	.629	.306
				Pearson Residual	-.079	-.129	-.213	.769	-.663
		3	2	Observed	0	0	0	1	0
				Expected	.047	.108	.203	.589	.053
				Pearson Residual	-.222	-.348	-.505	.835	-.236
			3	Observed	0	0	2	3	1
				Expected	.195	.473	.990	3.891	.450
				Pearson Residual	-.449	-.716	1.111	-.762	.851
			4	Observed	0	0	0	1	1
				Expected	.024	.062	.155	1.390	.370
				Pearson Residual	-.155	-.253	-.409	-.598	1.148
		4	3	Observed	0	0	1	0	0
				Expected	.041	.095	.188	.615	.061

				Pearson Residual	-.206	-.325	2.077	-1.264	-.254
			5	Observed	0	0	0	0	1
				Expected	.007	.020	.051	.654	.267
				Pearson Residual	-.087	-.142	-.232	-1.376	1.656
	4	1	3	Observed	0	0	0	1	0
				Expected	.063	.137	.232	.529	.039
				Pearson Residual	-.259	-.398	-.550	.943	-.202
			4	Observed	0	1	0	3	0
				Expected	.093	.234	.527	2.736	.410
				Pearson Residual	-.309	1.634	-.779	.284	-.676
		2	2	Observed	0	1	0	1	0
				Expected	.136	.290	.478	1.023	.072
				Pearson Residual	-.381	1.424	-.793	-.033	-.274
			3	Observed	0	0	3	4	0
				Expected	.332	.762	1.432	4.110	.364
				Pearson Residual	-.590	-.925	1.469	-.084	-.620
			4	Observed	0	1	0	8	1
				Expected	.175	.446	1.059	6.989	1.331
				Pearson Residual	-.422	.848	-1.088	.697	-.308
		3	2	Observed	1	0	2	2	0
				Expected	.326	.705	1.179	2.601	.188
				Pearson Residual	1.219	-.906	.865	-.538	-.442
			3	Observed	0	0	1	1	0
				Expected	.091	.211	.401	1.189	.108
				Pearson Residual	-.309	-.485	1.057	-.272	-.338
			4	Observed	0	0	0	4	2
				Expected	.101	.258	.616	4.198	.827
				Pearson Residual	-.320	-.519	-.829	-.177	1.390
			5	Observed	0	0	0	1	0
				Expected	.008	.022	.057	.668	.244
				Pearson Residual	-.092	-.151	-.246	.704	-.568
		4	2	Observed	0	3	0	1	0
				Expected	.323	.662	1.011	1.883	.121
				Pearson Residual	-.593	3.145	-1.163	-.885	-.353
			3	Observed	0	0	0	1	0
				Expected	.057	.126	.223	.551	.044
				Pearson Residual	-.245	-.380	-.535	.902	-.213
			4	Observed	0	0	0	2	0
				Expected	.042	.106	.244	1.382	.226

				Pearson Residual	-.207	-.335	-.527	.945	-.504
	5	1	2	Observed	0	0	0	1	0
				Expected	.088	.177	.259	.449	.027
				Pearson Residual	-.311	-.463	-.591	1.107	-.168
			3	Observed	1	0	0	0	1
				Expected	.124	.271	.462	1.063	.079
				Pearson Residual	2.567	-.560	-.776	-1.506	3.336
			4	Observed	0	0	0	2	2
				Expected	.093	.231	.523	2.739	.414
				Pearson Residual	-.308	-.496	-.776	-.795	2.604
			5	Observed	0	1	0	0	1
				Expected	.023	.060	.151	1.387	.378
				Pearson Residual	-.153	3.880	-.404	-2.128	1.124
		2	1	Observed	0	1	1	1	0
				Expected	.512	.789	.799	.860	.039
				Pearson Residual	-.786	.276	.262	.179	-.200
			2	Observed	1	0	1	1	0
				Expected	.201	.432	.715	1.542	.110
				Pearson Residual	1.842	-.711	.387	-.626	-.337
			3	Observed	0	0	4	2	0
				Expected	.282	.648	1.221	3.534	.315
				Pearson Residual	-.544	-.852	2.817	-1.273	-.577
			4	Observed	0	0	0	1	0
				Expected	.017	.044	.105	.699	.134
				Pearson Residual	-.133	-.215	-.343	.656	-.394
		3	3	Observed	0	1	0	1	0
				Expected	.090	.209	.399	1.192	.109
				Pearson Residual	-.308	1.828	-.706	-.277	-.340
			4	Observed	0	1	0	2	0
				Expected	.050	.128	.306	2.100	.417
				Pearson Residual	-.225	2.493	-.583	-.126	-.696
			5	Observed	0	0	0	1	0
				Expected	.008	.022	.057	.667	.246
				Pearson Residual	-.092	-.150	-.245	.706	-.571
		4	1	Observed	0	1	0	0	0
				Expected	.199	.281	.258	.251	.011
				Pearson Residual	-.498	1.598	-.589	-.579	-.105
			2	Observed	0	0	0	1	0
				Expected	.080	.164	.252	.473	.030

				Pearson Residual	-.295	-.444	-.581	1.055	-.177
			4	Observed	0	0	1	1	0
				Expected	.042	.105	.242	1.384	.228
				Pearson Residual	-.206	-.333	1.643	-.587	-.507
4	2	2	3	Observed	0	0	0	1	1
				Expected	.062	.151	.320	1.310	.157
				Pearson Residual	-.253	-.404	-.617	-.460	2.215
			4	Observed	0	0	0	4	0
				Expected	.045	.118	.297	2.770	.770
				Pearson Residual	-.214	-.349	-.566	1.333	-.976
			5	Observed	0	0	1	0	0
				Expected	.006	.015	.040	.615	.325
				Pearson Residual	-.075	-.124	4.909	-1.263	-.694
		3	2	Observed	0	0	0	1	0
				Expected	.043	.100	.195	.605	.057
				Pearson Residual	-.212	-.334	-.491	.808	-.246
			3	Observed	0	0	0	1	0
				Expected	.030	.073	.156	.660	.082
				Pearson Residual	-.175	-.280	-.430	.718	-.298
			4	Observed	0	0	0	3	0
				Expected	.033	.085	.215	2.070	.596
				Pearson Residual	-.182	-.297	-.481	1.161	-.863
		4	2	Observed	0	0	0	1	0
				Expected	.054	.120	.217	.563	.046
				Pearson Residual	-.238	-.370	-.526	.881	-.220
			3	Observed	0	0	1	0	0
				Expected	.037	.089	.179	.629	.066
				Pearson Residual	-.197	-.312	2.140	-1.302	-.266
			4	Observed	0	0	0	2	0
				Expected	.027	.071	.173	1.399	.330
				Pearson Residual	-.166	-.271	-.436	.927	-.628
	3	1	3	Observed	0	0	1	0	0
				Expected	.032	.078	.164	.650	.076
				Pearson Residual	-.182	-.291	2.258	-1.363	-.286
		2	4	Observed	0	0	0	2	1
				Expected	.026	.069	.178	2.019	.707
				Pearson Residual	-.163	-.267	-.435	-.023	.399
		3	1	Observed	0	0	0	1	0
				Expected	.090	.180	.260	.443	.027

				Pearson Residual	-.315	-.468	-.593	1.121	-.166
			3	Observed	0	0	0	3	0
				Expected	.070	.174	.394	2.053	.309
				Pearson Residual	-.267	-.430	-.673	1.176	-.587
			4	Observed	0	0	1	4	0
				Expected	.042	.111	.287	3.345	1.215
				Pearson Residual	-.206	-.338	1.371	.623	-1.267
		4	3	Observed	0	0	1	1	0
				Expected	.058	.142	.306	1.326	.167
				Pearson Residual	-.245	-.391	1.362	-.488	-.428
	4	1	4	Observed	0	1	0	1	0
				Expected	.033	.085	.204	1.400	.278
				Pearson Residual	-.184	3.203	-.476	-.617	-.568
		2	4	Observed	0	0	0	9	1
				Expected	.124	.323	.802	6.967	1.784
				Pearson Residual	-.355	-.578	-.934	1.399	-.647
			5	Observed	0	1	0	0	2
				Expected	.019	.049	.130	1.888	.914
				Pearson Residual	-.137	4.311	-.369	-2.256	1.362
		3	2	Observed	0	0	0	1	0
				Expected	.047	.108	.204	.588	.052
				Pearson Residual	-.222	-.348	-.506	.836	-.235
			3	Observed	0	0	0	1	0
				Expected	.033	.079	.165	.648	.075
				Pearson Residual	-.184	-.293	-.445	.737	-.284
			4	Observed	0	0	1	2	1
				Expected	.048	.124	.310	2.780	.737
				Pearson Residual	-.220	-.358	1.289	-.847	.339
		4	2	Observed	0	0	0	2	0
				Expected	.117	.258	.451	1.089	.084
				Pearson Residual	-.352	-.545	-.763	1.293	-.297
			4	Observed	0	0	1	2	0
				Expected	.045	.116	.281	2.102	.457
				Pearson Residual	-.213	-.347	1.427	-.128	-.735
	5	1	4	Observed	0	0	0	4	0
				Expected	.066	.169	.404	2.800	.561
				Pearson Residual	-.259	-.420	-.670	1.309	-.808
		2	3	Observed	0	0	0	0	1
				Expected	.034	.081	.168	.644	.073

				Pearson Residual	-.187	-.297	-.450	-1.345	3.569
			4	Observed	0	0	0	3	0
				Expected	.037	.096	.239	2.089	.540
				Pearson Residual	-.193	-.315	-.509	1.144	-.811
		3	2	Observed	0	0	0	1	0
				Expected	.047	.107	.203	.590	.053
				Pearson Residual	-.221	-.347	-.504	.833	-.236
			3	Observed	0	0	0	1	0
				Expected	.032	.078	.164	.649	.076
				Pearson Residual	-.183	-.292	-.444	.735	-.286
5	1	5	5	Observed	0	0	0	1	0
				Expected	.015	.039	.095	.701	.150
				Pearson Residual	-.125	-.202	-.324	.654	-.420
	2	3	4	Observed	0	0	0	1	0
				Expected	.002	.006	.017	.433	.541
				Pearson Residual	-.048	-.079	-.132	1.144	-1.086
		4	2	Observed	0	0	0	0	1
				Expected	.012	.031	.076	.694	.187
				Pearson Residual	-.109	-.178	-.288	-1.507	2.085
			4	Observed	0	0	1	0	0
				Expected	.003	.008	.021	.484	.484
				Pearson Residual	-.054	-.089	6.789	-.968	-.969
	3	3	3	Observed	0	0	0	1	0
				Expected	.005	.013	.035	.593	.353
				Pearson Residual	-.071	-.116	-.192	.828	-.739
		4	4	Observed	0	0	0	0	1
				Expected	.002	.006	.017	.427	.549
				Pearson Residual	-.047	-.078	-.130	-.862	.907
	5	1	3	Observed	0	0	0	0	1
				Expected	.010	.026	.065	.682	.217
				Pearson Residual	-.099	-.162	-.264	-1.465	1.897
			5	Observed	0	0	0	0	1
				Expected	.002	.005	.013	.370	.611
				Pearson Residual	-.042	-.069	-.115	-.766	.799
		2	5	Observed	0	0	0	1	0
				Expected	.001	.004	.010	.307	.678
				Pearson Residual	-.036	-.059	-.099	1.501	-1.452
Link function: Logit.									