



Developing Logistic Regression Model to Determine The Most Important Factors Influencing Job Satisfaction

Obaid Mahmood Mohsin Alzawbaee

Prof.Dr. Cihan University – Sulaymaniyah, Sulaymaniyah 46001, Kurdistan Region, Iraq

obed.muhsin@sulicihan.edu.krd

Ass. Prof. Dr. Diaa Obaed Mahmood

drdhiaaobaid@gmail.com

Middle Technical University - Institute of Technical Anbar

Ass. Lec. Ahmed Obaid Mahmood

Ahmedalzawb3ee@gmail.com

Middle Technical University – Institute of Technical Anbar

Abstract:

Job satisfaction is considered one of the important topics in revealing the positives and negatives of the organization from the point of view of its human resources. Therefore, there is a need for administrative leadership to pay attention to the issue of job satisfaction due to it contributes directly to improving performance and raising productivity. Hence, human resource development is of great importance in developing the efficiency of the human element, which reflects positively on the quality of products and services. In this study, the logistic regression technique was adopted to build a model that can predict the level of job satisfaction among teachers in private universities, by identifying independent variables with a significant impact from the total number of variables of (16) variables, as it turned out that (7) variables are significant, and they were arranged according to their importance. The tests proved the accuracy and strength of the model through the tests and through the classification percentage, where the correct classification rate reached 90%. Thus, to achieve job satisfaction, the administration of private universities requires that they focus their concerns on the independent variables that have a moral impact.

Keywords: job satisfaction, binary variable, logistic model, qualitative variables.

1. Introduction:

Job satisfaction is considered one of the important topics in revealing the positives and negatives of the organization from the point of view of its human resources. Therefore, the administration must adopt solid foundations with the aim of optimal investment of human resources by focusing on the quality of work life for employees and striving to provide good conditions for them and enhancing belonging to the organization. In this way, the development Human resources are of great importance in developing the efficiency of the human element, which reflects positively on the quality of products and services. {[14],[15],[16],[28]}

Our research came to build a statistical model that identifies variables that have a significant impact on employees' job satisfaction, arranged according to their importance, as well as variables that do not affect job satisfaction, which provides a reference for job satisfaction, and the model can also be adopted to detect job satisfaction.

The research problem is that organizations face the problem of how to ensure belonging, loyalty, and positive cooperation on the part of employees so that the organizations can achieve their goals. This has led to increased interest in studying job satisfaction as one of the important tools to achieve the above.

The importance of the research comes from identifying the factors with a moral impact on job satisfaction, arranged according to their importance, from the most important to the important, as well as the factors with a non-significant impact, from the point of view of a sample selected according to scientific and statistical foundations.

Thus, the goal of the research is to build a statistical model that includes variables that have a significant impact on job satisfaction, and through it (i.e., the model) it is possible to know the trend of each employee regarding whether their level of job satisfaction is high or not. To achieve the goal of the research, the technique of logistic regression analysis was adopted to build the model. This technique has many positive features. {[19],[20],[21]}

The issue of developing a model has been addressed by many researchers ,and the most critical research and studies on the subject were:

Study (2021) The adoption of e-learning as an alternative to regular education is a result of the world's exposure to the Corona pandemic, which led to the suspension of higher education institutions, and a decision was made to provide lectures to students and cooperate with them via electronic media in accordance with the e-learning system.

The research identified the variables that have a significant impact on e-learning, as the eight changes were arranged according to their importance in influencing the dependent variable. The research was conducted on a sample size of 325 students from one of the higher education institutions. The research concluded by identifying four independent variables that have a significant impact, The model that was built is effective in classification, as the percentage of correct classification of the built model is (80%).[23]

Study (2020) Considering that the issue of decision-making is one of the important issues in modern administration because of its impact on individuals, societies and countries, as most of the problems faced by individuals, societies and countries result from making incorrect decisions. The development of management science and the use of quantitative methods in treatment is constantly growing, as

decisions are affected by a variety of factors or variables. The research dealt with the variables or factors associated with the illusion of superiority and the level of ambition, using the logistic regression technique to identify the variables that have a significant impact on decision-making and arrange them according to its importance. The research concluded by building a model through which it is possible to predict the extent to which a decision is affected by the environment. The result of the analysis showed that out of ten factors that were identified and studied, three of them had a significant effect, while the other factors had no significant effect, and the model achieved a correct classification of 81%. [25].

Study (2012) studied the impact of job satisfaction on the performance of employees in university institutions. The study aimed to reveal the levels of job satisfaction of employees in a university. The study concluded that there is a direct relationship between the level of income and satisfaction with work, as well as between opportunities for promotion and satisfaction with work, and that all members of the sample are satisfied with their relationships with their colleagues, and there is dissatisfaction with participation in decisions. There is a need for administrative leadership to pay attention to the issue of job satisfaction because it contributes directly to improving performance and raising productivity. {[11],[22]}

Study (2009) The study aimed to measure the level of job satisfaction among technical workers in the medical services of the Armed Forces (Riyadh), as well as to know the relationship of job satisfaction to personal factors. The study concluded that there was dissatisfaction with the wage system, as well as the training program, opportunities for promotions, and attendance at seminars. {[3],[24]}

Study (2007) the fourth European survey on working conditions, where the study was conducted on 235 million workers from 31 European countries with the aim of knowing the average job satisfaction for these countries, and the most important finding of the study is that the job satisfaction rate reached 80%, and that job satisfaction is linked to job security, Work environment and opportunities for advancement and development: 35% of workers believe that their safety is at risk due to the nature of their work.[10]

2. Theoretical framework:

Job satisfaction is a subjective concept that expresses the positive feeling that a human resource has for his job, and it is considered one of the important means of raising the level of performance of the worker in terms of quantity and quality. Job satisfaction is linked to external factors such as wages, relationships with officials, colleagues in the organization, and internal factors that follow the individual's sense of accomplishment, importance, and abilities, as the internal factors are responsible for job satisfaction, while the external factors are responsible for dissatisfaction. The determinants of job satisfaction can be summarized as: satisfaction with the job itself, satisfaction with work relationships, satisfaction with the work environment, work systems, and income level. It is noted that the concept of job satisfaction has a role in building and developing management in general and expanding its fields in the modern era. Thus, management has become a dynamic human process that aims to meet the needs of employees as it leads to increased performance effectiveness. {[15],[24],[25],[26]}

The logistic regression analysis technique is considered one of the appropriate methods in such research and studies that aim to build predictive models in which the dependent variable is descriptive. The logistic regression model is a model used to predict the probability of an event occurring by fitting the

data to a logistic curve, and logistic regression is used (particularly binary logistic regression Binomial (which is common in the uses of logistic regression) is a binary dependent variable and independent variables that are quantitative or qualitative. The technique of logistic regression analysis does not require many conditions as is the case in regression analysis, for example. The conditions of logistic regression are the absence of multicollinearity between the independent variables. {[1],[2],[4],[6],[27]}

The logistic regression is based on the assumption that the dependent variable (y) that we are interested in is considered as a binary variable that takes the value (1) with probability (P) and value (0) with probability (1-P):

$$E(y|x) = P(y = 1) = P \dots \dots \dots (1)$$

Thus, the value of the right side would be limited between (1, 0), and the model is not applicable from the regression point of view. To solve this problem, we introduce an appropriate mathematical variable on the dependent variable (y):

$$0 \leq P \leq 1$$

Thus, the ratio $\left(\frac{P}{1-P}\right)$ Is a positive value $(\infty, 0)$, explicitly:

$$0 \leq \frac{P}{1-P} \leq \infty$$

By taking the natural logarithm we get:

$$-\infty \leq \ln\left(\frac{P}{1-P}\right) \leq \infty \dots \dots \dots (2)$$

Thus, the regression model can be written in the case of one independent variable:

$$\ln\left(\frac{P}{1-P}\right) = b_0 + b_1 x_1 \dots \dots \dots (3)$$

If there is more than one independent variable, the model be:

$$\ln\left(\frac{P}{1-P}\right) = b_0 + \sum_{i=1}^n b_j x_{ij} \dots \dots \dots (4)$$

$$j = 1, 2, \dots, k$$

$$i = 1, 2, \dots, n$$

Equation (4) above represents the logistic regression model. The following transformation $\ln\left(\frac{P}{1-P}\right)$ is called (Logit Transformation). {[7],[8],[9],[12]} .

Logistics regression is a model that takes the form of a logistic function as in figure (1), and it is used to predict the probability of a particular event by documenting the data in a logistic curve.

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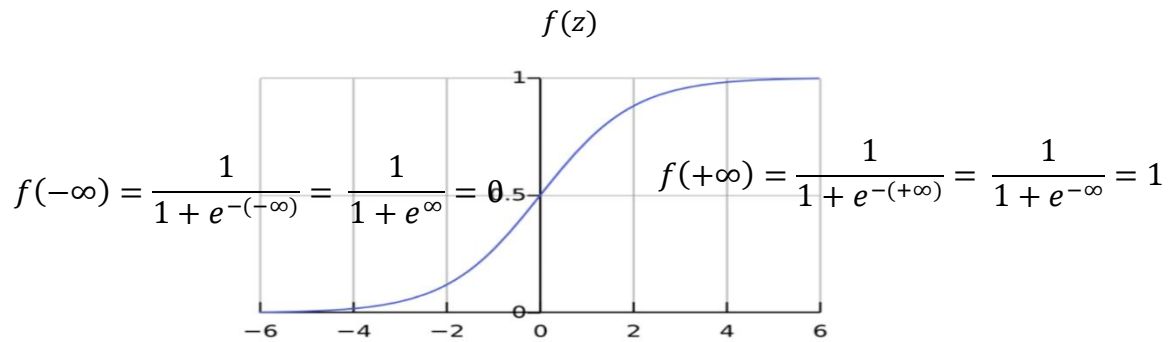


Figure 1: Logistics function

The regression in the figure above is based on the logistic curve that takes the formula as in the following equation:

Range

$$0 \leq f(z) \leq 1$$

$$P = \frac{e^{a+bx}}{1 + e^{a+bx}} = \frac{1}{1 + e^{-(a+bx)}} \dots \dots \dots (5)$$

Instead of the straight-line equation $y = b_0 + b_1x + e$ which made this subject of regression called logistic regression. One of the features of logistic regression analysis is that it arranges the effect of independent variables, allowing the researcher to conclude that one variable is stronger than the other variable. Also, the logistic regression does not require the independent variables to follow the normal distribution nor the relationship with the dependent variable to be a linear relationship. {[13], [17], [18].

3. Practical aspect:

3.1. Search data:

The research data was collected through a questionnaire prepared for this purpose (Appendix No. (1)), and the data represents the opinions of a sample of university teachers of size (50), representing teachers in one of the private universities.

The dependent variable (y), and independent variables (X, s) were determined as follows:

(y) = 1 if the respondent's answer is that his degree of job satisfaction is greater than or equal to 50%

(y) = 0 if the respondent's answer is that his job satisfaction degree is less than 50%

Y = In general, what is your current degree of job satisfaction with the organization you work for?

And the independent variables (X1, X2,, X16)

Whereas, if the respondent's answer is greater than or equal to 50%, a value is given to the independent variable = 1, and if the respondent's answer is less than 50%, a value is given to the independent variable = 0, for all sixteen independent variables, which are as follows:

X1= There is a safe, safe, supportive, and friendly work environment.

X2= I feel that the organization I work for follows fair policies and practices through a fair and equal system.

X3= I feel that the administration provides fair care and appreciates good work without discrimination.

X4= I receive high appreciation from management and co-workers, which encourages me to work more.

X5= I feel satisfied with the wages I am paid.

X6= I believe that the administration practices fair and uneven procedures regarding promotions.

X7= Management cares about personal relationships and follows up on employees' events and participates in them.

X8= Provides management and helps workers to obtain higher positions in an equal manner and without discrimination.

X9= I feel comfortable with my relationships with my colleagues.

X10= In specific cases, management practices assigning employees difficult tasks in order to create a challenging environment.

X11= Management often assigns employees greater responsibilities without any exception or discrimination.

X12= The administration encourages and supports creativity in a fair and equal manner.

X13= Management is interested in developing the personal skills and hobbies of employees.

X14= Management exercises positive and directive comments on employees' activities.

X15= The management has great flexibility towards employees regarding working hours and other obligations.

X16= I feel that the nature of my work in the organization is appropriate for my abilities.

3.2.Presentation and interpretation of results:

After reviewing and tabulating the data, the statistical packages program (SPSS) was used to analyze the data.

To estimating the model parameters, the maximum likelihood method and rotation were adopted, whereby the optimal estimation of the model parameters was obtained, where the derivative of the second negative maximum likelihood function, and its lowest value reached at the eighth rotation:

$$-2\text{Log likelihood} = 31.243$$

As shown in Table (1):

Table (1). Iteration History^{a,b,c,d}

Iteration		-2 Log likelihood	Coefficients																
			Constant	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15	x16
Step 1	1	41.305	-2.650	-.998	-.040	.881	1.275	1.481	1.244	-.459	1.040	-.244	-.154	-.595	.049	-.285	-.416	.773	1.232
	2	35.068	-4.426	-1.717	-.155	1.285	1.957	2.621	2.319	-.858	1.902	-.167	-.418	-1.082	.048	-.550	-.723	1.496	1.879
	3	32.494	-6.459	-2.410	-.185	1.584	2.713	4.017	3.548	-1.258	2.742	-.317	-.634	-1.495	.222	-.890	-1.085	2.359	2.446
	4	31.499	-8.712	-3.144	-.177	1.913	3.554	5.512	4.873	-1.580	3.515	-.679	-.767	-1.797	.532	-1.238	-1.440	3.299	2.930
	5	31.261	-10.434	-3.765	-.213	2.254	4.258	6.606	5.876	-1.837	4.109	-.919	-.912	-2.050	.773	-1.466	-1.641	4.007	3.266
	6	31.243	-11.060	-4.011	-.239	2.402	4.535	6.995	6.242	-1.948	4.337	-.986	-.988	-2.158	.862	-1.538	-1.699	4.261	3.389
	7	31.243	-11.121	-4.036	-.242	2.418	4.563	7.033	6.278	-1.961	4.360	-.992	-.997	-2.170	.871	-1.544	-1.704	4.285	3.401
	8	31.243	-11.122	-4.036	-.242	2.418	4.564	7.033	6.278	-1.961	4.360	-.992	-.997	-2.170	.871	-1.544	-1.704	4.286	3.401
a. Method: Enter																			
b. Constant is included in the model.																			
c. Initial -2 Log Likelihood: 65.342																			
d. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.																			

Table (2) show the values of the model parameters, which are represented by column (B), the standard error (S.E) for each parameter, and the Wald statistic, in addition to the significance of the parameters and the value Logistics:

Table (2). Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)
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								Lower	Upper
Step 1 ^a	x1	-4.036	2.309	3.056	1	.080	.018	.000	1.631
	x2	-.242	1.465	.027	1	.869	.785	.044	13.846
	x3	2.418	1.808	1.788	1	.181	11.222	.324	388.175
	x4	4.564	2.558	3.182	1	.074	95.930	.637	14442.588
	x5	7.033	3.545	3.935	1	.047	1133.851	1.088	1181629.857
	x6	6.278	3.277	3.671	1	.055	532.931	.866	328095.674
	x7	-1.961	1.866	1.105	1	.293	.141	.004	5.451
	x8	4.360	2.268	3.695	1	.055	78.294	.918	6676.074
	x9	-.992	2.387	.173	1	.678	.371	.003	39.895
	x10	-.997	1.641	.369	1	.544	.369	.015	9.206
	x11	-2.170	1.684	1.661	1	.198	.114	.004	3.097
	x12	.871	1.497	.338	1	.561	2.388	.127	44.902
	x13	-1.544	1.322	1.364	1	.243	.213	.016	2.850
	x14	-1.704	1.497	1.295	1	.255	.182	.010	3.424
	x15	4.286	2.460	3.035	1	.081	72.652	.585	9017.957
	x16	3.401	1.529	4.948	1	.026	30.000	1.498	600.614
	Constant	-11.122	5.515	4.067	1	.044	.000		

a. Variable(s) entered on step 1: x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16.

To test the efficiency and quality of the model by using the Log Likelihood Ratio, which follows the Chi-square distribution according to the relationship:

$$\chi^2 = -2[\log_e l_0 - \log_e l_1] \dots \dots \dots (6)$$

where

L_1 = the value of the Likelihood function containing (i) variable.

L_0 = the value of the Likelihood function containing (i - 1) variable.

Where the value reached ($\chi^2 = 34.099$). And it is significant, as shown in tables (3).

Table (3). Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	34.099	16	.005
	Block	34.099	16	.005
	Model	34.099	16	.005

To determine the goodness of fit of the model, the (Hosmer & Lemshow) test was adopted. This test is based on calculating the statistic for the difference between the observed values and the expected values. If the (χ^2) value is not significant, we accept the null hypothesis (H_0), which is what It confirms the goodness of fit of the entire model, and table (4) show this:

Table (4). Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.736	8	.988

We note that the value of (χ^2) and the degree of freedom (8) are not significant (sig= 0.988), which confirms the good fit of the model.

To know the strength of the model that was built in classifying vocabulary, see Table (5), and we note that the percentage of correct classification 90%. There is more than good percentages and indicate the strength of the model that was built.

Table (5). Classification Table^a

		Observed	Predicted		
			y		Percentage Correct
			0	1	
Step 1	y	0	30	2	93.8
		1	3	15	83.3
	Overall Percentage				90.0

Referring to Table No. (2) and noting the values in column (B), which contains the model parameters in units' logit, and that the models is:

$$\text{Len}(p/(1-p)) = -11.12 - 4.036 X_1 + 4.564 X_4 + 7.033 X_5 + 6.278 X_6 + 4.360 X_8 + 4.286 X_{15} + 3.401 X_{16}$$

β	β	Exp(B)	
constant	-11.12	0.00	
β_1	-4.036	0.018	7
β_4	4.564	95.930	3
β_5	7.033	1133.851	1
β_6	6.278	532.931	2
β_8	4.36	78.294	4
β_{15}	4.286	72.652	5
β_{16}	3.401	30.000	6

The results shown in the same tables indicate that the independent variables that have a significant impact on job satisfaction are as follows:

We note that the variable (X5) ranked first in influencing the dependent variable (Y), while the variable (X6) came in second place, the variable (X4) came in third place, the variable (X8) came in fourth place, and the variable (X15) came in fifth place, the variable (X16) ranked sixth, and the variable (X1) ranked seventh. As for the other independent variables

(X7, X9,X10,X12,X13,X14,X3,X11,X2) .It does not have a significant effect on the dependent variable (Y).

4. Conclusions and recommendations:

The most important conclusions and recommendations reached by the research are:

1-The results showed that some of the model parameters are significant ($\beta_5, \beta_6, \beta_4, \beta_8, \beta_{15}, \beta_{16}, \beta_1, \beta_0$), and others are not significant ($\beta_2, \beta_3, \beta_7, \beta_9, \beta_{10}, \beta_{11}, \beta_{12}, \beta_{13}, \beta_{14}$).

2- The logistic regression technique can be adopted by building a statistical model that can predict job satisfaction or job dissatisfaction among teachers in one of the private universities under research.

3-The independent variables with a significant impact are (in order of importance) :

X5= I feel satisfied with the wages I am paid.

X6= I believe that the administration practices fair and uneven procedures regarding promotions.

X4= I receive high appreciation from management and co-workers, which encourages me to work more.

X8= Provides management and helps workers to obtain higher positions in an equal manner and without discrimination.

X15= The management has great flexibility towards employees regarding working hours and other obligations.

X16= I feel that the nature of my work in the organization is appropriate for my abilities.

X1= There is a safe, safe, supportive, and friendly work environment

The values of the parameters are respectively: ($\beta_5 = 7.033, \beta_6 = 6.278, \beta_4 = 4.564, \beta_8 = 4.36, \beta_{15} = 4.286, \beta_{16} = 3.401, \beta_1 = -4.036, \beta_0 = -11.12$).

- 4- The tests proved the significance of the model that was built, as the value of (χ^2) calculated from the maximum likelihood function reached (34.099) with degrees of freedom (16), which is significant.
- 5- The goodness of fit of the model was achieved by adopting the Hosmer & Lemeshow test, which depends on the difference between the observed frequencies and the expected frequencies. The test result showed that the result was not significant, which confirms the absence of significant differences, and it confirms the goodness of fit of the model that was built.
- 6- The percentage of correct classification of the model that was built was (90%), There is more than good percentages and indicate the strength of the model that was built, which indicates whether there is a job satisfaction rate of 50% or more, or if job satisfaction is less than 50%.
- 7- Expanding the use of the logistic regression technique as it represents an effective method in measuring the job satisfaction of university teachers.
- 8- If private university administrations want to achieve high job satisfaction among their teachers, they must pay attention to the independent variables with a significant impact mentioned above.

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