

Clustering Technique for Analyzing Leadership Style of the Head of the Institutions

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Abstract: *The goal of the current research is to compare the responses provided by Head of the Institutions on Leadership style. The study uses a two-step Cluster Analysis technique, and a number of clusters are produced with the location of the institutions serving as a key predictor of the clusters. The impact of the Predictors on cluster formation is also examined. Each cluster has a different formation in relation to the predictors. The result showed that, whenever the number of Clusters was increased, the number of predictors also increased. It was also found that Location becomes the most important predictor. Similar views about Leadership styles have been recorded depending on the Location of the Institutions.*

Keywords: Leadership Style, Cluster Analysis, Stratified Random Sampling, Leadership, Predictors

I. INTRODUCTION

Since the era of the ancient philosophers, the subject of leadership has been the subject of heated discussion. Philosophers studied how people obtain and hold positions of authority in the 19th century. Theories of leadership shifted towards a more individualized approach with the development of psychology as a field of study. Researchers have studied leadership from a variety of angles throughout the years, such as behavioral, trait, and to a much lesser extent, contextual. These factors led to the development of numerous, occasionally competing leadership theories. Researchers are investigating the need for new leadership prototypes in the twenty-first century to accommodate the shifting global demographics. There are various styles of leadership- Commanding, Democratic, Visionary, Affiliative, Coaching, which are taken up in this study through two-step Cluster Analysis. The procedure is divided into two primary steps: Observations are first divided into small subclusters before being handled as separate observations. The distance criteria are used to determine whether to build a new cluster or add an observation to an existing one. The hierarchical cluster technique is used to organize these recent observations. The two-step Cluster Analysis algorithm may predetermine the number of clusters or may determine it itself. The subclusters are sorted into the required number of clusters during the grouping phase, which serves as the foundation for the analysis. Because there are fewer subclusters than data, it is simple to apply traditional grouping techniques. The accuracy of the technique rises with the number of subclusters.

II. LITERATURE REVIEW

Reviews on Leadership Styles

Abasilim, Gberegbe & Osibanjo (2019) undertook a study on *Leadership Styles and Employees' Commitment: Empirical Evidence from Nigeria*. The goal was to investigate the connection between management practises and team commitment. The findings showed a minor negative association between transactional leadership style and employee commitment and a medium positive relationship between transformational leadership style and employee commitment.

Hasan Al Khajeh (2018) to investigate the effects of various leadership styles on organisational performance, a study titled *Impact of Leadership Styles on Organisational Performance* was taken up. According to the report, every organisation should employ leadership that will improve the employing company's skills.

Cook (2014) made a study on *Sustainable School Leadership: The Teachers' Perspective*. The findings demonstrated that sustainable leadership plays a role in both teacher and staff professional development and student academic

success. It became clear that by taking on leadership responsibilities, teachers can improve and elevate sustainable school leadership.

Kiranh (2013) did a study on *Teachers' and School Administrators' Perceptions and Expectations on Teacher Leadership* to learn what primary school teachers and principals thought about and expected from teacher leadership. The outcome showed that primary school teachers' and principals' expectations regarding teacher leadership are higher than perceptions.

Larkin et al. (2009) took a study on *Implementing and Sustaining Science Curriculum Reform: A Study of Leadership Practises Among Teachers Within a High School Science Department* was conducted. The study's findings showed that the instructors' philosophical goals, attention to public perceptions, staff stability, responsibility distribution, and instructional coherence were all crucial factors in their leadership behaviour.

2.1 Reviews on Cluster Analysis

Mohanta et al. (2023) in their research work *Introspecting Institutional Commitment Using Cluster Analysis* attempts to study the likeness of the responses given by secondary school teachers regarding Institutional Commitment. The study uses a two-step cluster analysis technique, and various clusters are produced in relation to the gender of the teachers and the locations of the institutions. The impact of the Predictors on cluster formation is also examined.

Mohanta et al. (2023) in their research work *Perceptual Environment: A Study on Organizational Climate Using Cluster Analysis* has under taken 400 Secondary School Teachers through Stratified Random Sampling. The results showed that gender effects the conclusions about the institutional atmosphere. It is conceivable to infer from the aforementioned two facts that reactions to institutional environment vary on both gender and location of the institution.

Gorain et al. (2022) in their research paper *A Study on Relationship and Cluster Analysis among Internet Dependency, Social Isolation and Personality*. Despite the weak and unreliable relationships between these elements, three clusters are produced. In order to achieve the aforementioned objectives, correlations between Internet Dependency, Social Isolation, and five distinct personality factors are looked into for art, science, and all art and science learners. Male and female students in the arts formed two distinct clusters, whereas science students formed a single cluster.

Saha et al. (2021) in their research paper *Analysis of Attitude Towards Yoga Among College Students Using Clustering Techniques* discusses views regarding yoga practice and are examined among college students in the Purulia, India. To conduct the research, a two-step cluster analysis is used to establish five clusters.

Desjardins et al. (2021). In their research work *Cluster analysis is found to be useful tool for helping leadership educators categorize students and by doing so, program architects have an opportunity to design and develop interventions tailored to better meet the needs of individual students* finds the importance of instructional design in the ODE retention and dropout equation and helps explain, in part, why previous studies have not reached a consensus on which variables should be considered to explain dropout rates.

Facca & Allen (2011) in their research work *Using Cluster Analysis to Segment Students Based on Self-Reported Emotionally Intelligent Leadership Behaviors*, finds cluster analysis to be useful tool for helping leadership educators categorize students and by doing so, program architects have an opportunity to design and develop interventions tailored to better meet the needs of individual students.

2.2 Rationale of the Study

Gender and Location of the institution contributes important inputs on the views of Head of the Institutions regarding different components of Leadership Style. Therefore, Head of the Institutions (Male and Female) working in Rural and Urban schools may have different views regarding different components of Leadership Style. Clustering Analysis is a helpful technique to study the situation about the accumulation of inputs given by Head of the Institutions with respect to their gender and location of the institute. Different types of leadership styles (different dimensions) play important role for formation of clusters.

2.3 Objectives

The objectives of the research work taken up are:

- To find out pair wise relationship among different dimensions of Leadership Style.

- To find out the cluster using independent variables – gender and location, and dependent variables- Commanding, Democratic, Visionary, Affiliative, Coaching.
- To find out importance of the predictors of the clusters for formation of clusters.

III. METHODOLOGY

Method: Descriptive Survey Method is used in the research work.

Sample: To undertake the research work a sample of 40 Head of the Institutions from West Bengal Board of Secondary Education (WBBSE) were taken.

Sampling Procedure: Stratified Random Sampling has been applied to collect data for the study.

Statistical Techniques Used

Product Moment Method is applied to calculate the Coefficient of Correlation in the research work.

In order to classify the total sample into different clusters, two step clustering technique is used in the research work.

IV. RESULTS AND DISCUSSION

Correlations						
		Commanding	Democratic	Visionary	Affiliative	Coaching
Commanding	Pearson Correlation	1	.739**	.679**	.476**	.292
	Sig. (2-tailed)		.000	.000	.002	.067
	N	40	40	40	40	40
Democratic	Pearson Correlation	.739**	1	.692**	.577**	.243
	Sig. (2-tailed)	.000		.000	.000	.131
	N	40	40	40	40	40
Visionary	Pearson Correlation	.679**	.692**	1	.779**	.382*
	Sig. (2-tailed)	.000	.000		.000	.015
	N	40	40	40	40	40
Affiliative	Pearson Correlation	.476**	.577**	.779**	1	.237
	Sig. (2-tailed)	.002	.000	.000		.140
	N	40	40	40	40	40
Coaching	Pearson Correlation	.292	.243	.382*	.237	1
	Sig. (2-tailed)	.067	.131	.015	.140	
	N	40	40	40	40	40

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

Table 1: Coefficient of Correlation among Different Dimensions of Leadership Style

From Table 1 Commanding is significantly related (.01 level of significance) to Democratic, Visionary and Affiliating dimensions. But, it is not significantly related to Coaching. Democratic is significantly related (.01 level of significance) to Visionary and Affective dimensions. But, not significantly related to Coaching. Visionary is significantly related to Affective (.01 level of significance) and Coaching (.05 level of significance). Affective is not significantly related to Coaching. Seven out of ten relationships are significant. Only Coaching is not significantly related to other three dimensions, viz. Commanding, Democratic and Affective. It is interesting to note that the dimensions Commanding, Democratic, Visionary and Affective are significantly related to each other.

Clusters

Input (Predictor) Importance
 1.0 0.8 0.6 0.4 0.2 0.0

Cluster	1	2
Label		
Description		
Size	65.0% (26)	35.0% (14)
Inputs	Location Urban (100.0%)	Location Rural (92.9%)
	Visionary 33.81	Visionary 32.14
	Gender Female (53.8%)	Gender Male (64.3%)
	Affiliative 38.81	Affiliative 37.29
	Commanding 74.15	Commanding 72.36
	Democratic 28.23	Democratic 27.79
	Coaching 34.04	Coaching 33.86

Table 2: Formation of 2 Clusters
Predictor Importance

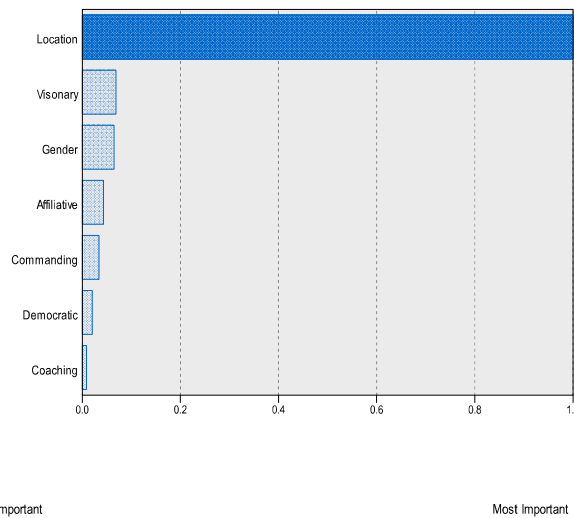
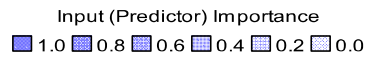


Figure 1: Predictor Importance for the clusters described in Table 2

Table 2 represents the clusters formed by Head of the Institutions in which Cluster 1 is the largest cluster consisting of Urban institutions (100%), dominated by Female Head of the Institutions (53.8%) and is 65% of the total sample size. Cluster 2 dominated by Male Head of the Institutions (64.3%) and made up of 35% of total sample size, consisting of rural institutions (92.9%). From Figure 1 it is clear that location is a major predictor of the clusters, where Gender, Commanding, Democratic, Visionary, Affiliative, Coaching are very low predictors of the clusters mentioned in Table 2.

Clusters



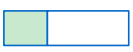
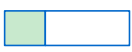
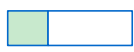
Cluster	1	2	3
Label			
Description			
Size	 35.0% (14)	 32.5% (13)	 32.5% (13)
Inputs	Location Urban (100.0%)	Location Urban (100.0%)	Location Rural (100.0%)
	Gender Female (100.0%)	Gender Male (100.0%)	Gender Male (61.5%)
	Visionary 34.64	Visionary 32.00	Visionary 32.92
	Coaching 34.50	Coaching 33.54	Coaching 33.85
	Commanding 74.29	Commanding 72.00	Commanding 74.23
	Democratic 28.00	Democratic 27.85	Democratic 28.38
	Affiliative 38.71	Affiliative 38.08	Affiliative 38.00

Table 3: Formation of 3 Clusters

Predictor Importance

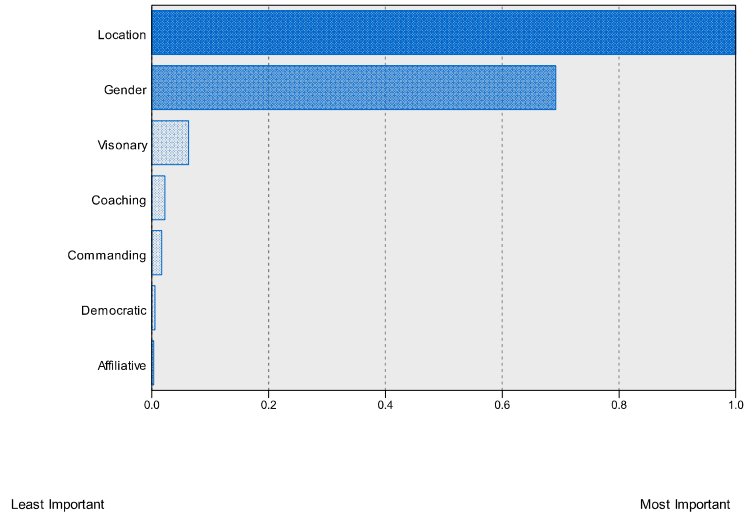


Figure 2: Predictor Importance for the clusters described in Table 3

Table 3 represents the clusters formed by Head of the Institutions in which Cluster 1 is the largest cluster with Female Head of the Institutions (100%), consisting of Urban institutions (100%) and is 35% of the total sample size. Cluster 2 (Male 100%) and Cluster 3 (Male 61.5%) consists of 32.5% of total sample size. From Figure 2 it is clear that location and gender are major predictors of the clusters, where Commanding, Democratic, Visionary, Affiliative, Coaching are very low predictors of the clusters mentioned in Table 2.

Clusters

Cluster	1	2	4	3
Label				
Description				
Size	35.0% (14)	30.0% (12)	30.0% (12)	5.0% (2)
Inputs	Location Urban (100.0%) Commanding 74.29 Gender Female (100.0%) Visionary 34.64 Democratic 28.00 Affiliative 38.71 Coaching 34.50	Location Urban (100.0%) Commanding 74.00 Gender Male (100.0%) Visionary 32.83 Democratic 28.50 Affiliative 38.92 Coaching 33.50	Location Rural (100.0%) Commanding 76.33 Gender Male (66.7%) Visionary 33.83 Democratic 29.00 Affiliative 38.75 Coaching 33.67	Location Urban (50.0%) Commanding 48.50 Gender Female (50.0%) Visionary 22.00 Democratic 20.50 Affiliative 28.50 Coaching 35.00

Table 4: Formation of 4 Clusters

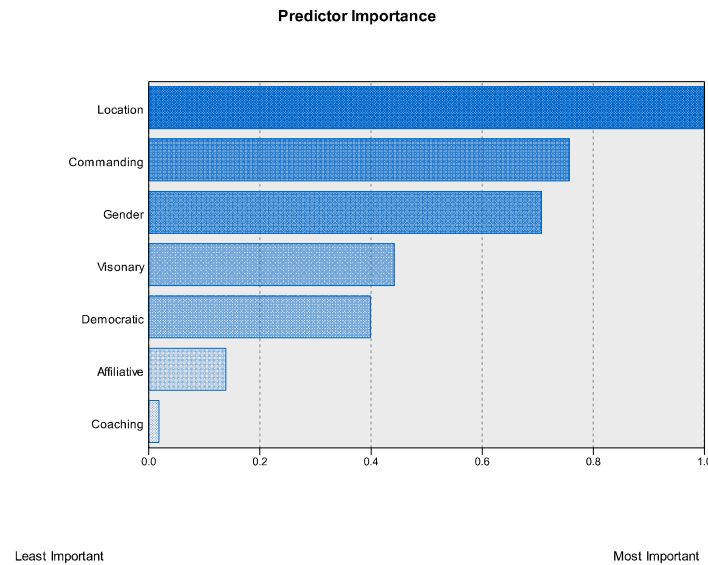


Figure 3: Predictor Importance for the clusters described in Table 4

Table 4 represents the clusters formed by Head of the Institutions in which Cluster 1 is the largest cluster consisting Female Head of the Institutions (100%) of Urban institutions (100%) and is 35% of the total sample size. Cluster 2 (Male 100%) and Cluster 4 (Male 66.7%) consists of 30% each of total sample size with Urban (100%) and Rural (100%) institutions respectively. Cluster 3 (Male 50%, Female 50%) is the smallest consisting of 5% of the total sample size with Urban (50%) and Rural (50%) institutions. From Figure 3 it is clear that Location, Commanding, and Gender are high predictors where, Democratic and Visionary are mediocre predictors, and Affiliative and Coaching are very low predictors of the clusters mentioned in Table 4.

Clusters

Input (Predictor) Importance
■ 1.0 ■ 0.8 ■ 0.6 ■ 0.4 ■ 0.2 ■ 0.0

Cluster	3	5	1	2	4
Label					
Description					
Size	30.0% (12)	30.0% (12)	27.5% (11)	7.5% (3)	5.0% (2)
Inputs	Location Urban (100.0%)	Location Rural (100.0%)	Location Urban (100.0%)	Location Urban (100.0%)	Location Urban (50.0%)
	Commanding 74.00	Commanding 76.33	Commanding 72.36	Commanding 81.33	Commanding 48.50
	Visionary 32.83	Visionary 33.83	Visionary 32.91	Visionary 41.00	Visionary 22.00
	Gender Male (100.0%)	Gender Male (66.7%)	Gender Female (100.0%)	Gender Female (100.0%)	Gender Female (50.0%)
	Democratic 28.50	Democratic 29.00	Democratic 27.00	Democratic 31.33	Democratic 20.50
	Affiliative 38.92	Affiliative 38.75	Affiliative 36.45	Affiliative 47.00	Affiliative 28.50
	Coaching 33.50	Coaching 33.67	Coaching 33.55	Coaching 36.00	Coaching 35.00

Table 5: Formation of 5 Clusters
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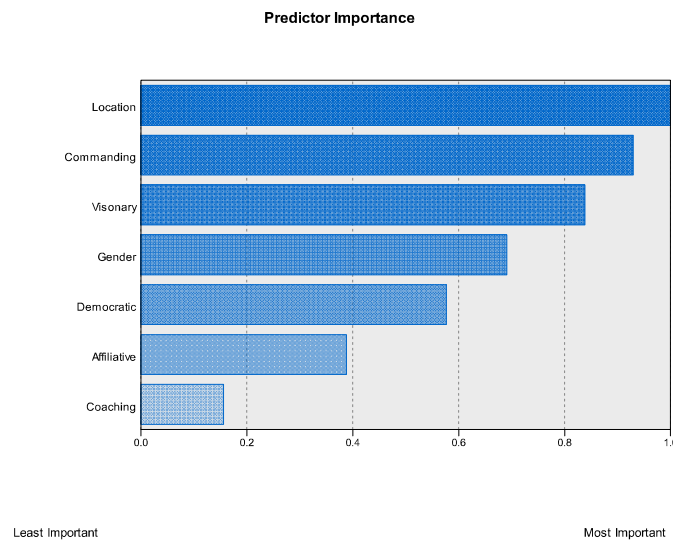


Figure 4: Predictor Importance for the clusters described in Table 5

Table 5 represents the clusters formed by Head of the Institutions in which Cluster 3 (Male 100%) formed of Urban institutions and Cluster 5 (Male 66.7%) of Rural institutions. Both consists of 30% of the total sample size. Cluster 1 (Female 100%) consisting of Urban institutions (100%) with sample size 27.5% of total sample. Cluster 2 (Female 100%) consists of Urban (100%) with sample size 7.5% of total sample. Cluster 4 (Female 50%, Male 50%) consists of Urban (50%) and Rural (50%) with sample size 5% of the total sample size. From Figure 4 it is clear that location, gender, Commanding, Visionary are major predictors of the clusters, where Democratic and Affiliative are mediocre predictors, and Coaching is a very low predictor of the clusters mentioned in Table 5.

V. CONCLUSION

From the above analysis it was found that when there are two Clusters, Location is the only important predictor of the Clusters. With the increase of one more Cluster, Location and Gender become two important predictors but, when four clusters are considered predictors like Location, Commanding, Gender, Visionary and Democratic become important predictors. When the number of Clusters are increased to five, all the predictors except Coaching play significant role for the formation of the Cluster. Therefore, to summarize, whenever the number of Clusters are increased, the number of predictors also increase. It was also found that Location becomes the most important predictor. Finally, it may be concluded that, similar views about Leadership styles have been recorded depending on the Location of the institutions.

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