

# Analysis Report

This report is structured as follows.

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SAMPLE REPORT - Rafael Data Analysis Portfolio

## **Sample Characterization**

The sample is composed by 39 individuals who are divided in the following groups (table below).

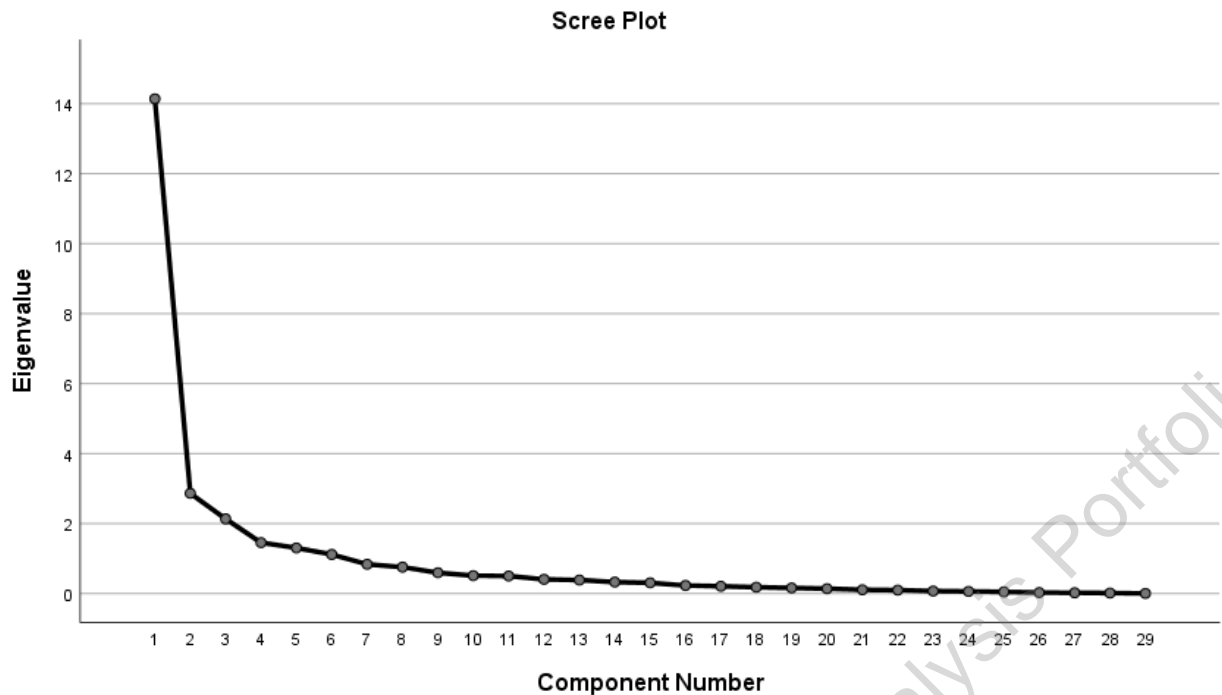
		Count	Column N %
Department	ESTIMATING	2	5.1%
	EXECUTIVE LEADERSHIP	4	10.3%
	FENCING/WELDING	9	23.1%
	GRADING	3	7.7%
	OFFICE	3	7.7%
	PAVING	5	12.8%
	SALES	10	25.6%
	SEALING	3	7.7%
How many years have you worked at MUNSON?	Five years to ten years	8	21.1%
	Less than one year	9	23.7%
	More than ten years	7	18.4%
	Two years to five years	14	36.8%

## **Factor Analysis**

The Kaiser-Meyer-Olkin measure, which checks the adequacy of our data for factor analysis, yielded a value of 0.564. This suggests that our data is moderately suited for the procedure, although typically, values closer to 1 are more ideal.

In addition, the Bartlett's Test of Sphericity returned a value of 1026.283 and was statistically significant with a p-value less than 0.001. This significant result indicates that there's enough correlation between our variables to proceed with the factor analysis.

Finally, a review of the screeplot (Figure below) revealed a modest elbow at the fourth component, signaling that adding a fourth factor might not be very beneficial in explaining additional variance in our data. Consequently, based on this visual inspection, we've decided to retain three factors for our analysis. 66% of total variance was captured by these factors, with 48.8% of the variance captured by a single factor.



The factor loadings of the three-factor solution are shown below. A few cross-loadings were present. If the difference between loadings on two different factors was below 0.200, items were thus considered to cross-load and was dropped from the solution. This ensured that only items that have a clear and dominant association with one factor are retained, which helps in obtaining a clearer and more interpretable factor structure. This was the case of the following items:

- Leaders in this organization know how to clearly communicate their ideas.
- This organization is more innovative than most organizations I have worked in.
- Everyone works together effectively in this company during times of organizational change.
- In our company, people are held accountable for the quality of their work.
- Non-performers don't last long in this organization.
- People in this company can take on any challenge.
- Leaders in this organization have a credible track record.
- Our organization has a clear way to communicate important information to everyone.

*Rotated Component Matrix<sup>a</sup>*

	Component		
	1 ( $\lambda$ )	2 ( $\lambda$ )	3 ( $\lambda$ )
This company is likely to struggle economically in a few years.	<b>0.875</b>	-0.018	0.060
We are all aware of key messages from our executive leadership team.	<b>0.865</b>	0.089	0.169
I am losing confidence in our ability to innovate.	<b>0.790</b>	0.315	0.044
Our company mission gives us confidence that this company will double in size in the next 10 years.	<b>0.788</b>	0.290	0.137
Leaders in this organization get things done.	<b>0.774</b>	<b>0.423</b>	0.234
Leaders in this organization maintain focus on the goals they set.	<b>0.768</b>	<b>0.428</b>	0.300
We're losing ground in the marketplace.	<b>0.761</b>	0.003	0.228
Leaders here take the time to ensure we understand their expectations.	<b>0.747</b>	<b>0.454</b>	0.131
This company has a strong vision of the future - we know where we're going.	<b>0.734</b>	0.330	0.236

People in this company are confident about its future.	<b>0.696</b>	<b>0.458</b>	0.166
Leaders in this organization know exactly what they want to accomplish.	<b>0.683</b>	0.355	0.386
During an economic downturn, this company is likely to fail.	<b>0.631</b>	-0.040	0.335
Leaders in this organization know how to clearly communicate their ideas.	<b>0.606</b>	0.366	<b>0.435</b>
This organization is more innovative than most organizations I have worked in.	<b>0.582</b>	<b>0.572</b>	0.063
Every effort is made to prevent barriers between departments.	0.125	<b>0.731</b>	0.176
This organization can meet customer requirements because the employees are extremely competent.	-0.003	<b>0.709</b>	0.090
Because our departments work together well, this organization can beat our competition.	0.132	<b>0.704</b>	0.358
People in this company can work together to accomplish a complex project.	<b>0.421</b>	<b>0.649</b>	-0.059
People here have a sense of purpose.	0.111	<b>0.622</b>	<b>0.414</b>
Everyone works together effectively in this company during times of organizational change.	<b>0.521</b>	<b>0.607</b>	0.141
In our company, people are held accountable for the quality of their work.	0.289	<b>0.570</b>	<b>0.416</b>
Non-performers don't last long in this organization.	<b>0.449</b>	<b>0.523</b>	0.013
People in this company can take on any challenge.	0.234	<b>0.517</b>	0.327
People are rewarded here when they go beyond the call of duty.	-0.006	0.091	<b>0.888</b>
Promotions and rewards in this organization are based on merit and performance.	0.126	0.049	<b>0.807</b>
Funding and managerial focus is consistently applied to the right programs, products and projects.	0.289	0.254	<b>0.745</b>
Two-way communication is the norm here. Leaders listen to our feedback.	0.189	0.340	<b>0.709</b>
Leaders in this organization have a credible track record.	<b>0.477</b>	0.167	<b>0.645</b>
Our organization has a clear way to communicate important information to everyone.	0.326	0.325	<b>0.477</b>

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

A new solution was generated, with a KMO of 0.695 and Barlett's test of sphericity yielding a chi-square of 685.876,  $p < 0.001$ . This indicated good factorability. The new factor solution is shown in the table below.

#### *Rotated Component Matrix<sup>a</sup>*

	Component		
	1 ( $\lambda$ )	2 ( $\lambda$ )	3 ( $\lambda$ )
This company is likely to struggle economically in a few years.	<b>0.886</b>	-0.054	0.000
We are all aware of key messages from our executive leadership team.	<b>0.870</b>	0.064	0.143
I am losing confidence in our ability to innovate.	<b>0.800</b>	0.302	0.020
Our company mission gives us confidence that this company will double in size in the next 10 years.	<b>0.805</b>	0.232	0.143
Leaders in this organization get things done.	<b>0.805</b>	0.395	0.188
Leaders in this organization maintain focus on the goals they set.	<b>0.797</b>	0.405	0.253
We're losing ground in the marketplace.	<b>0.777</b>	-0.026	0.152
Leaders here take the time to ensure we understand their expectations.	<b>0.767</b>	0.418	0.116
This company has a strong vision of the future - we know where we're going.	<b>0.743</b>	0.332	0.184
People in this company are confident about its future.	<b>0.716</b>	0.443	0.151
Leaders in this organization know exactly what they want to accomplish.	<b>0.716</b>	0.337	0.342
During an economic downturn, this company is likely to fail.	<b>0.652</b>	-0.055	0.287
Every effort is made to prevent barriers between departments.	0.144	<b>0.749</b>	0.180
This organization can meet customer requirements because the employees are extremely competent.	0.048	<b>0.754</b>	0.040
Because our departments work together well, this organization can beat our competition.	0.179	<b>0.672</b>	0.358
People in this company can work together to accomplish a complex project.	0.438	<b>0.652</b>	-0.107

People here have a sense of purpose.	0.156	<b>0.627</b>	0.401
People are rewarded here when they go beyond the call of duty.	0.037	0.071	<b>0.927</b>
Promotions and rewards in this organization are based on merit and performance.	0.168	0.050	<b>0.847</b>
Funding and managerial focus is consistently applied to the right programs, products and projects.	0.344	0.275	<b>0.682</b>
Two-way communication is the norm here. Leaders listen to our feedback.	0.221	0.376	<b>0.687</b>

Upon revision of the content of the questions, the factors were labelled as follows:

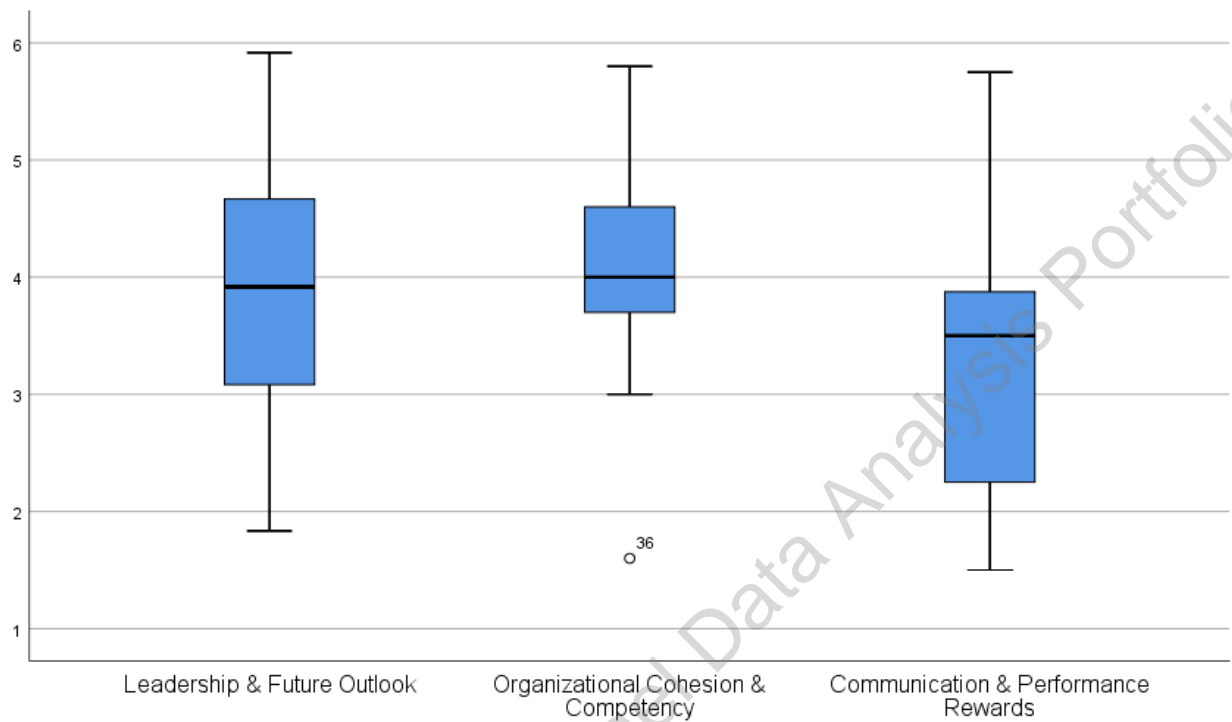
- Component 1: Leadership & Future Outlook
- Component 2: Organizational Cohesion & Competency
- Component 3: Communication & Performance Rewards

### **Descriptive Statistics and Reliability Test**

The table below shows the means and standard deviations of the variables under study. The statistics for the composite factors are in bold. The examination of Cronbach's Alphas ( $\alpha$ ) showed very good reliability of all three factors.

	Mean	SD	$\alpha$
During an economic downturn, this company is likely to fail.	4.436	0.968	
I am losing confidence in our ability to innovate.	3.769	1.224	
Leaders here take the time to ensure we understand their expectations.	3.763	1.218	
Leaders in this organization get things done.	4.205	1.704	
Leaders in this organization know exactly what they want to accomplish.	3.718	1.213	
Leaders in this organization maintain focus on the goals they set.	3.641	1.224	
Our company mission gives us confidence that this company will double in size in the next 10 years.	3.564	1.334	
People in this company are confident about its future.	3.872	1.301	
This company has a strong vision of the future - we know where we're going.	3.615	1.206	
This company is likely to struggle economically in a few years.	4.079	1.050	
We are all aware of key messages from our executive leadership team.	3.897	1.095	
We're losing ground in the marketplace.	3.949	1.213	
<b>Leadership &amp; Future Outlook</b>	<b>3.876</b>	<b>1.028</b>	<b>0.960</b>
Because our departments work together well, this organization can beat our competition.	4.103	1.095	
Every effort is made to prevent barriers between departments.	3.333	1.243	
People here have a sense of purpose.	4.282	0.887	
People in this company can work together to accomplish a complex project.	4.385	0.935	
This organization can meet customer requirements because the employees are extremely competent.	4.462	1.120	
<b>Organizational Cohesion &amp; Competency</b>	<b>4.113</b>	<b>0.796</b>	<b>0.808</b>
Funding and managerial focus is consistently applied to the right programs, products and projects.	3.513	1.189	
People are rewarded here when they go beyond the call of duty.	2.744	1.409	
Promotions and rewards in this organization are based on merit and performance.	3.308	1.398	
Two-way communication is the norm here. Leaders listen to our feedback.	3.308	1.080	
<b>Communication &amp; Performance Rewards</b>	<b>3.218</b>	<b>1.072</b>	<b>0.863</b>

The graph below illustrated the distribution of scores in the sample for the three factors. Extreme outliers are absent. Just a mild outlier was found for the Organizational Cohesion & Competency factor, which will not disrupt the analysis since its influence is diluted among all other participants. Normality and homogeneity of variances will be checked in the next sections to ensure that all test assumptions are met.



The following table presents descriptive statistics of each survey item disaggregated by department.

	Department									
	EXECUTIVE LEADERSHIP		FENCING/WELDING		OFFICE AND ESTIMATING		SALES		SEALING, PAVING, GRADING	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
During an economic downturn, this company is likely to fail.	4.250	1.258	4.778	.667	4.600	1.140	4.600	.843	4.000	1.095
This company is likely to struggle economically in a few years.	3.750	.500	4.778	.667	4.000	1.225	3.889	.782	3.818	1.401
We are all aware of key messages from our executive leadership team.	3.000	.816	4.333	.707	3.800	1.483	4.000	1.054	3.818	1.250
We're losing ground in the marketplace.	3.500	.577	4.444	1.236	3.800	1.304	4.000	1.333	3.727	1.272
I am losing confidence in our ability to innovate.	3.000	.816	4.444	.882	3.400	1.140	3.300	1.494	4.091	1.136
Leaders here take the time to ensure we understand their expectations.	3.000	1.414	4.375	.744	3.600	1.517	3.500	1.080	3.909	1.375
Leaders in this organization get things done.	2.750	.957	5.111	1.269	4.200	2.168	4.100	1.370	4.091	2.071
Leaders in this organization know exactly what they want to accomplish.	3.250	.957	4.111	.782	3.800	1.643	3.700	.823	3.545	1.695
Leaders in this organization maintain focus on the goals they set.	3.000	.816	4.333	.707	3.600	1.517	3.400	1.174	3.545	1.508
Our company mission gives us confidence that this company will double in size in the next 10 years.	2.250	.957	4.333	1.000	4.000	1.871	3.400	1.174	3.364	1.286
People in this company are confident about its future.	2.500	1.915	4.667	.866	4.200	1.483	3.800	.919	3.636	1.286
This company has a strong vision of the future - we know where we're going.	3.000	1.414	4.111	.782	3.800	1.483	3.400	1.174	3.545	1.368
Because our departments work together well, this organization can beat our competition.	4.250	.957	4.111	.928	4.600	1.140	3.600	1.265	4.273	1.104
Every effort is made to prevent barriers between departments.	2.500	1.291	2.889	1.054	3.400	1.673	3.400	1.174	3.909	1.136
People here have a sense of purpose.	3.750	.957	4.222	.667	4.600	.548	4.500	.707	4.182	1.250

	Department									
	EXECUTIVE LEADERSHIP		FENCING/WELDING		OFFICE AND ESTIMATING		SALES		SEALING, PAVING, GRADING	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
People in this company can work together to accomplish a complex project.	4.000	.816	4.556	1.130	4.200	1.095	4.200	1.033	4.636	.674
This organization can meet customer requirements because the employees are extremely competent.	4.750	.500	4.778	.833	4.200	1.304	4.200	1.398	4.455	1.214
Funding and managerial focus is consistently applied to the right programs, products and projects.	3.750	.500	3.556	1.333	4.200	1.483	3.500	.972	3.091	1.300
People are rewarded here when they go beyond the call of duty.	3.000	.816	1.778	1.093	4.200	1.483	3.000	1.333	2.545	1.368
Promotions and rewards in this organization are based on merit and performance.	4.000	.000	2.556	1.667	4.000	1.225	3.500	1.269	3.182	1.471
Two-way communication is the norm here. Leaders listen to our feedback.	3.250	.500	3.111	1.167	4.200	1.095	3.200	1.135	3.182	1.079



### **Normality Test**

The Shapiro-Wilk test was conducted to determine the normality of the data for the three factors. The non-significant results for the three scales ( $p > 0.05$ ) indicate that the variables follow normal distributions.

#### *Tests of Normality*

	Shapiro-Wilk		
	Statistic	df	Sig.
Leadership & Future Outlook	.976	39	.565
Organizational Cohesion & Competency	.966	39	.283
Communication & Performance Rewards	.951	39	.091

## Correlations

The table below shows a correlation matrix of the factors under study (Pearson's correlation).

<i>Correlations</i>		Leadership & Future Outlook	Organizational Cohesion & Competency	Communication & Performance Rewards
Leadership & Future Outlook	Pearson Correlation	1	.551**	.442**
	Sig. (2-tailed)		.000	.005
	N	39	39	39
Organizational Cohesion & Competency	Pearson Correlation	.551**	1	.464**
	Sig. (2-tailed)	.000		.003
	N	39	39	39
Communication & Performance Rewards	Pearson Correlation	.442**	.464**	1
	Sig. (2-tailed)	.005	.003	
	N	39	39	39

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

- **Leadership & Future Outlook and Organizational Cohesion & Competency:** They have a correlation of .551, which is significant at the 0.01 level ( $p = .000$ ). This indicates a moderate positive relationship between the two variables.
- **Leadership & Future Outlook and Communication & Performance Rewards:** They share a correlation of .442, significant at the 0.01 level ( $p = .005$ ). This suggests a moderate positive association between them.
- **Organizational Cohesion & Competency and Communication & Performance Rewards:** Their correlation is .464, which is also significant at the 0.01 level ( $p = .003$ ). This indicates another moderate positive relationship.

All these positive correlations suggest that as one variable increases, the other tends to increase as well, and vice versa.

### One-Way Analysis of Variance

A One-way ANOVA was used to investigate significant differences across departments. The tables below show means and standard deviations of the three factors across two different grouping schemes of departments.

		Department				F	p
		EXECUTIVE LEADERSHIP	FIELD OPERATIONS GROUPS	OFFICE AND ESTIMATING	SALES		
Leadership & Future Outlook	Mean	3.104	4.088	3.900	3.750	1.094	.365
	SD	.688	1.067	1.421	.789		
Organizational Cohesion & Competency	Mean	3.850	4.210	4.200	3.980	.339	.797
	SD	.755	.706	.927	.986		
Communication & Performance Rewards	Mean	3.500	2.888	4.150	3.300	2.196	.106
	SD	.354	1.116	1.167	.896		

Field Operations Groups seem to have the highest mean score for Leadership & Future Outlook, while Executive Leadership has the lowest. Field Operations Groups and Office and Estimating both have notably high mean scores for Organizational Cohesion & Competency, indicating a strong sense of cohesion and competency in these departments.

The Office and Estimating department scores the highest in terms of Communication & Performance Rewards. In contrast, Field Operations Groups have the lowest mean score for this factor.

The F-statistic measures the difference between group means, and the p-value tells us if those differences are statistically significant. None of the tests yielded a significant result, suggesting we cannot consider these differences to be significant given our sample. Tukey's posthoc tests did not find significant differences between any two specific departments too ( $p > 0.05$ )

		Department					F	p
		EXECUTIVE LEADERSHIP	FENCING /WELDING	OFFICE AND ESTIMATING	SALES	SEALING, PAVING, GRADING		
Leadership & Future Outlook	Mean	3.104	4.492	3.900	3.750	3.758	1.525	.217
	SD	.688	.647	1.421	.789	1.249		
Organizational Cohesion & Competency	Mean	3.850	4.111	4.200	3.980	4.291	.307	.871
	SD	.755	.567	.927	.986	.822		
Communication & Performance Rewards	Mean	3.500	2.750	4.150	3.300	3.000	1.685	.176
	SD	.354	1.152	1.167	.896	1.129		

The second group scheme shows similar ANOVA results. Fencing/Welding shows a high rating in Leadership & Future Outlook but scores lowest in Communication & Performance Rewards. Sealing, Paving, Grading scores highest in Organizational Cohesion & Competency. Office and Estimating

rates highest in Communication & Performance Rewards but is just in the mid-range for the other factors.

In summary, while there are variations in the mean scores across departments for the three factors, the ANOVA test suggests that these differences aren't statistically significant. This implies that, statistically speaking, the departments perform relatively similarly across the three measured factors.

### **Accountability and Communication**

Firstly, the factorability of both scales was evaluated. The item 'Non-performers don't last long in this organization.' Loaded poorly on the Accountability factor (table below).

*Component Matrix<sup>a</sup>*

	Component 1( $\lambda$ )
Funding and managerial focus is consistently applied to the right programs, products and projects.	.847
In our company, people are held accountable for the quality of their work.	.715
Non-performers don't last long in this organization.	.350
People are rewarded here when they go beyond the call of duty.	.818
Promotions and rewards in this organization are based on merit and performance.	.789

Extraction Method: Principal Component Analysis.  
a. 1 components extracted.

The removal of this item culminated on an acceptable solution with a KMO of 0.691 and a significant test of sphericity ( $\lambda^2 = 60.674$ ,  $p < 0.001$ ). Cronbach's Alpha indicated good reliability ( $\alpha = 0.810$ ).

Communication also had an acceptable KMO of 0.630 and passed the test of sphericity ( $\lambda^2 = 52.134$ ,  $p < 0.001$ ) and reliability ( $\alpha = 0.772$ ). Factors loadings are shown below.

*Component Matrix<sup>a</sup>*

	Component 1 ( $\lambda$ )
Leaders here take the time to ensure we understand their expectations.	.839
Our organization has a clear way to communicate important information to everyone.	.697
Two-way communication is the norm here. Leaders listen to our feedback.	.736
We are all aware of key messages from our executive leadership team.	.808

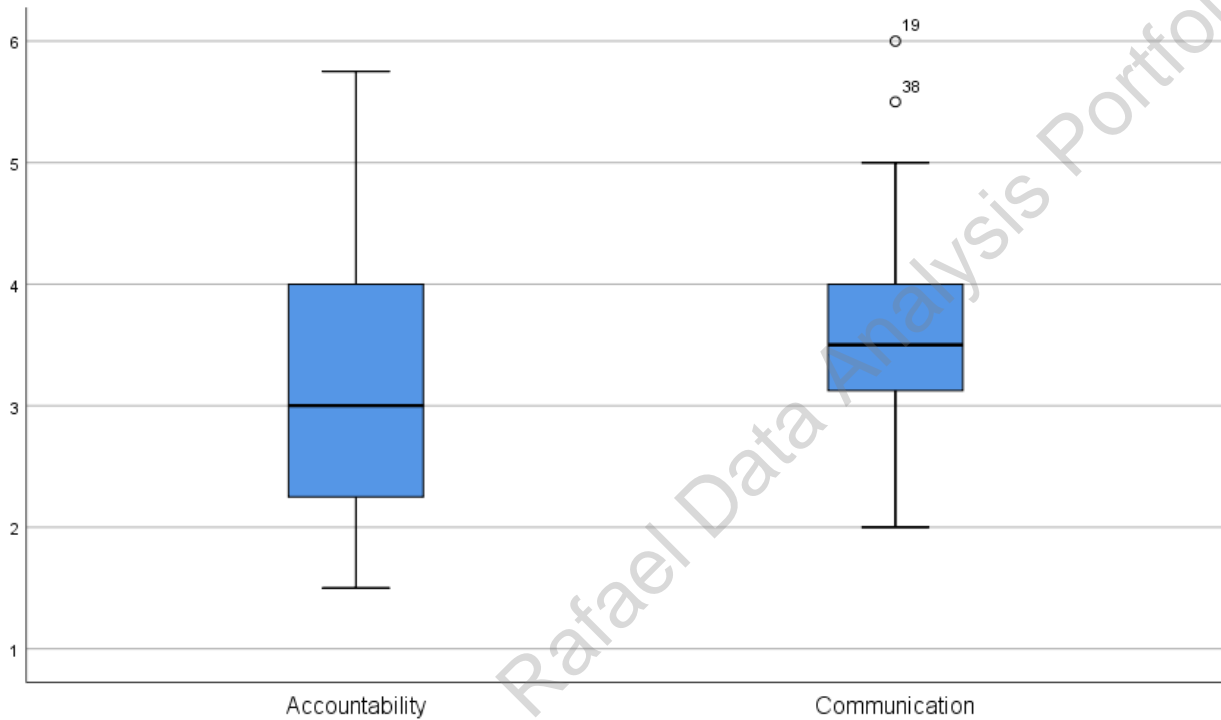
Extraction Method: Principal Component Analysis.  
a. 1 components extracted.

Both scales are normally distributed according to Shapiro Wilk's test (table below).

### Tests of Normality

	Shapiro-Wilk		
	Statistic	df	Sig.
Accountability	.960	39	.172
Communication	.955	39	.120

The boxplots show the distribution of scores for both scales across the sample. No substantial outliers were detected in both cases.



Both scales are correlated ( $r = 0.679$ ,  $p < 0.001$ ). The analysis indicates a moderately strong positive relationship between the two scales. This correlation indicates that as values on one scale tend to increase, the values on the other scale also tend to increase in a consistent manner.

	Department								F	p
	FIELD									
	EXECUTIVE		OPERATIONS		OFFICE AND					
	LEADERSHIP		GROUPS		ESTIMATING		SALES			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Accountability	3.563	.427	3.013	1.204	4.000	1.403	3.200	.743		
Communication	3.188	.591	3.713	.863	3.800	1.351	3.625	.719		

	Department										F	p
	EXECUTIVE		FENCING/		OFFICE AND				SEALING,			
	LEADERSHIP		WELDING		ESTIMATING		SALES		PAVING,			
									GRADING			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Accountability	3.563	.427	2.889	1.098	4.000	1.403	3.200	.743	3.114	1.329		
Communication	3.188	.591	3.944	.705	3.800	1.351	3.625	.719	3.523	.965		

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