Online-Appendix zu

„Is Visiting the ESB Website Deteriorating the Air Quality of our Countries? A Statistical Analysis of the Relationship Between Air Pollution Levels and Information & Communication Technologies “

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Appendix A Data

A.1 WDC Categories

▶ **Overall top strengths**
▷ **Overall top weaknesses**

AUSTRALIA

KNOWLEDGE

Subfactors	2015	2016	2017	2018	2019
Talent	3	6	8	8	7
Training & education	38	47	51	32	29
Scientific concentration	10	12	14	11	13

Talent	Rank
Educational assessment PISA - Math	23
International experience	35
Foreign highly-skilled personnel	10
Management of cities	26
▷ Digital/Technological skills	44
▶ Net flow of international students	1

Training & education	Rank
▷ Employee training	44
Total public expenditure on education	21
Higher education achievement	13
Pupil-teacher ratio (tertiary education)	32
▷ Graduates in Sciences	53
Women with degrees	10

Scientific concentration	Rank
Total expenditure on R&D (%)	19
Total R&D personnel per capita	-
Female researchers	-
R&D productivity by publication	17
Scientific and technical employment	6
High-tech patent grants	42
Robots in Education and R&D	24

TECHNOLOGY

Subfactors	2015	2016	2017	2018	2019
Regulatory framework	8	6	11	6	7
Capital	15	15	16	18	19
Technological framework	13	17	21	19	17

Regulatory framework	Rank
Starting a business	5
▶ Enforcing contracts	5
Immigration laws	23
Development and application of technc	22
Scientific research legislation	20
Intellectual property rights	14

Capital	Rank
IT & media stock market capitalization	37
Funding for technological development	36
Banking and financial services	28
▶ Country credit rating	1
Venture capital	34
Investment in Telecommunications	14

Technological framework	Rank
▷ Communications technology	54
Mobile Broadband subscribers	5
Wireless broadband	9
Internet users	29
Internet bandwidth speed	38
High-tech exports (%)	28

FUTURE READINESS

Subfactors	2015	2016	2017	2018	2019
Adaptive attitudes	2	2	4	2	7
Business agility	26	22	42	28	35
IT integration	6	8	10	6	11

Adaptive attitudes	Rank
E-Participation	5
Internet retailing	9
▶ Tablet possession	3
Smartphone possession	9
Attitudes toward globalization	32

Business agility	Rank
Opportunities and threats	38
World robots distribution	29
▷ Agility of companies	45
Use of big data and analytics	28
Knowledge transfer	30

IT integration	Rank
▶ E-Government	2
Public-private partnerships	26
Cyber security	39
Sofware piracy	5

A.2 EPI categories

Policy Objective	Issue Category	TLA	Wt.	Indicator	TLA	Wt.	Page
Environmental Health HLT (40%)	Air Quality	AIR	65%	Household Solid Fuels	HAD	40%	5
				$PM_{2.5}$ Exposure	PME	30%	6
				$PM_{2.5}$ Exceedance	PMW	30%	7
	Water & Sanitation	H2O	30%	Drinking Water	UWD	50%	9
				Sanitation	USD	50%	10
	Heavy Metals	HMT	5%	Lead Exposure	PBD	100%	11
Ecosystem Vitality ECO (60%)	Biodiversity & Habitat	BDH	25%	Marine Protected Areas	MPA	20%	12
				Biome Protection (National)	TBN	20%	13
				Biome Protection (Global)	TBG	20%	15
				Species Protection Index	SPI	20%	17
				Representativeness Index	PAR	10%	18
				Species Habitat Index	SHI	10%	19
	Forests	FOR	10%	Tree Cover Loss	TCL	100%	20
	Fisheries	FSH	10%	Fish Stock Status	FSS	50%	21
				Regional Marine Trophic Index	MTR	50%	23
	Climate & Energy	CCE	30%	CO_2 Emissions – Total	DCT	50%	29
				CO_2 Emissions – Power	DPT	20%	30
				Methane Emissions	DMT	20%	31
				N_2O Emissions	DNT	5%	32
				Black Carbon Emissions	DBT	5%	33
	Air Pollution	APE	10%	SO_2 Emissions	DST	50%	34
				NO_X Emissions	DXT	50%	35
	Water Resources	WRS	10%	Wastewater Treatment	WWT	100%	36
	Agriculture	AGR	5%	Sustainable Nitrogen Management	SNM	100%	38

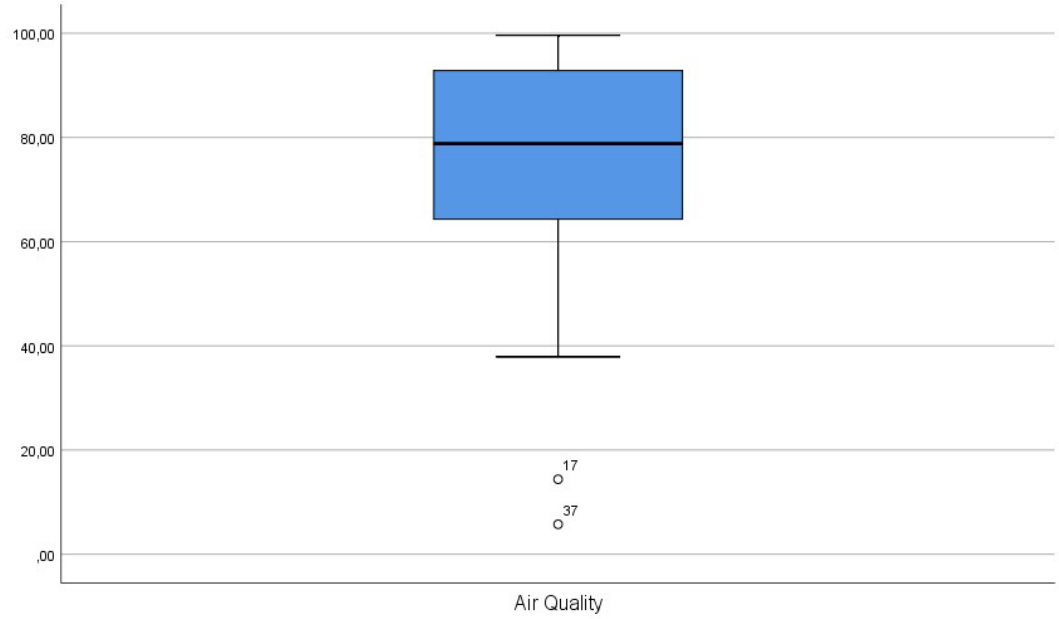
Appendix B Original data (N=63)

B.1 Air quality descriptive statistics

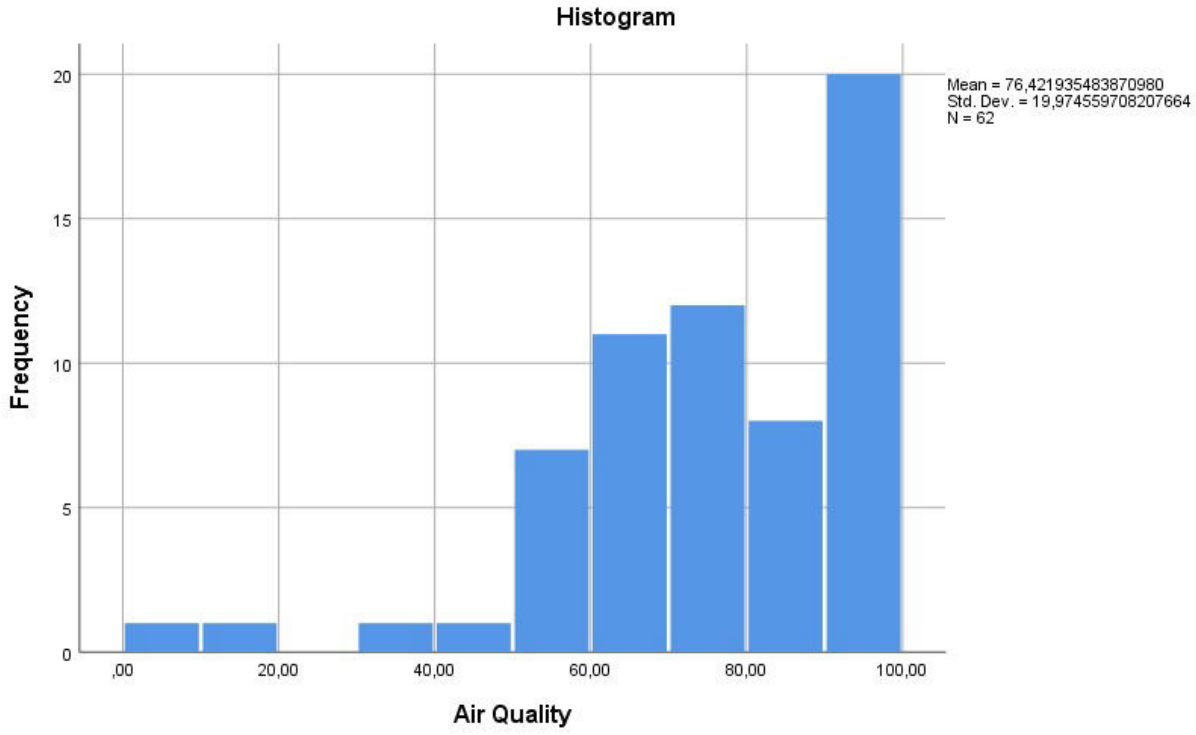
Descriptives

			Statistic	Std. Error
Air Quality	Mean		76.42193548 3870970	2.536771619 715262
	95% Confidence Interval for Mean	Lower Bound	71.34934712 3343450	
		Upper Bound	81.49452384 4398490	
	5% Trimmed Mean		78.28057347 6702500	
	Median		78.82500000 0000000	
	Variance		398.983	
	Std. Deviation		19.97455970 8207668	
	Minimum		5.750000000 000000	
	Maximum		99.61000000 0000000	
	Range		93.86000000 0000000	
	Interquartile Range		28.75749999 9999993	
	Skewness		-1.296	.304
	Kurtosis		2.343	.599

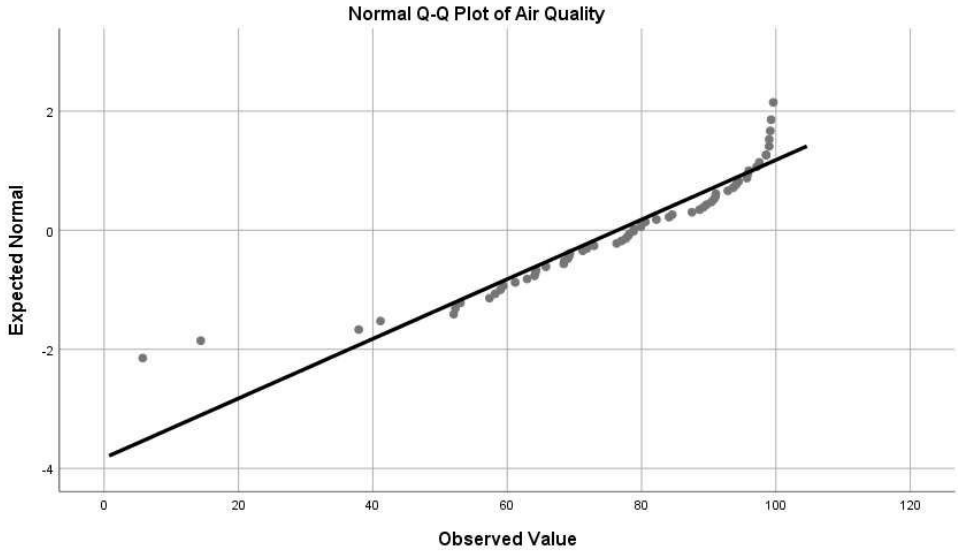
B.1.1 Air Quality box plot



B.1.2 Air Quality Histogram



B.1.3 Air Quality Normal Q-Q Plot

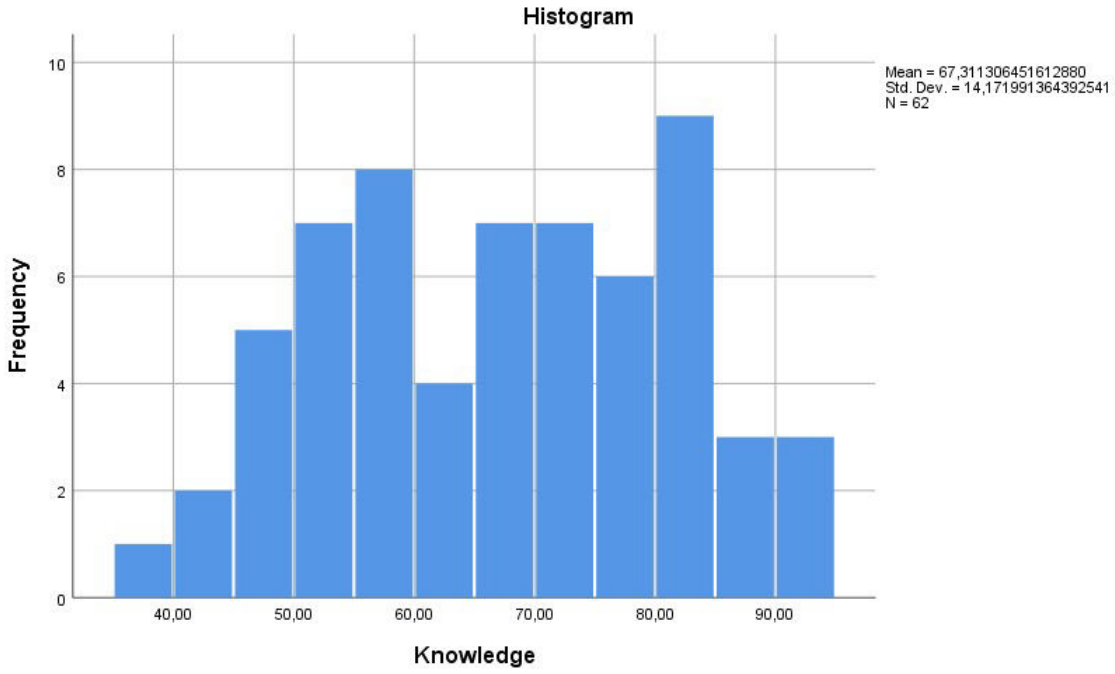


B.2 Knowledge descriptive statistics

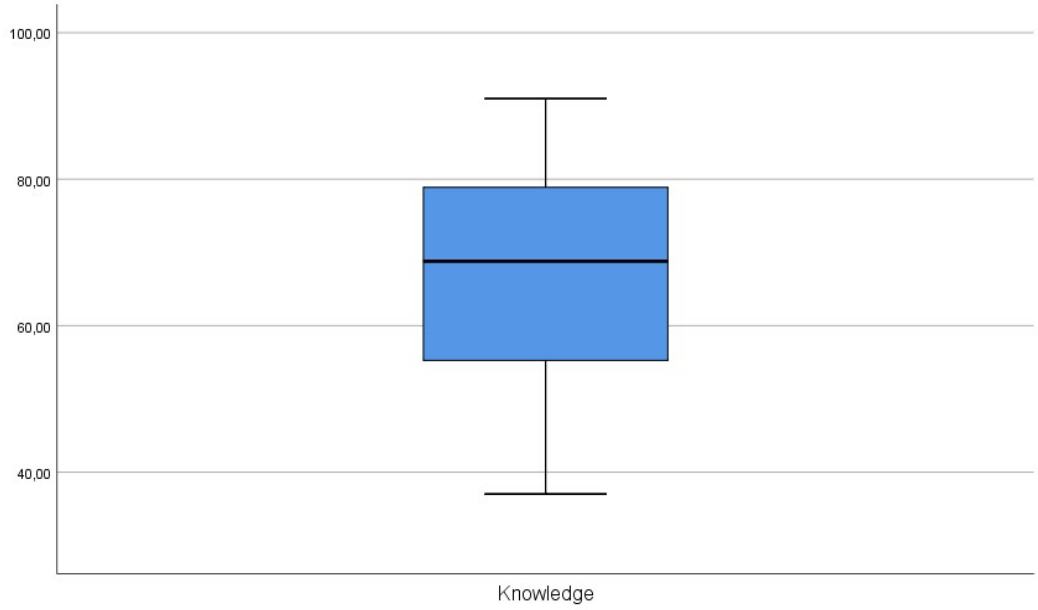
Descriptives

			Statistic	Std. Error
Knowledge	Mean		67.31130645 1612910	1.799844703 123456
	95% Confidence Interval for Mean	Lower Bound	63.71229453 3919690	
		Upper Bound	70.91031836 9306130	
	5% Trimmed Mean		67.41802150 5376340	
	Median		68.79250000 0000000	
	Variance		200,845	
	Std. Deviation		14.17199136 4392540	
	Minimum		37.01700000 0000000	
	Maximum		90.99800000 0000000	
	Range		53.98100000 0000000	
	Interquartile Range		24.18174999 9999994	
	Skewness		-.108	.304
	Kurtosis		-1.025	.599

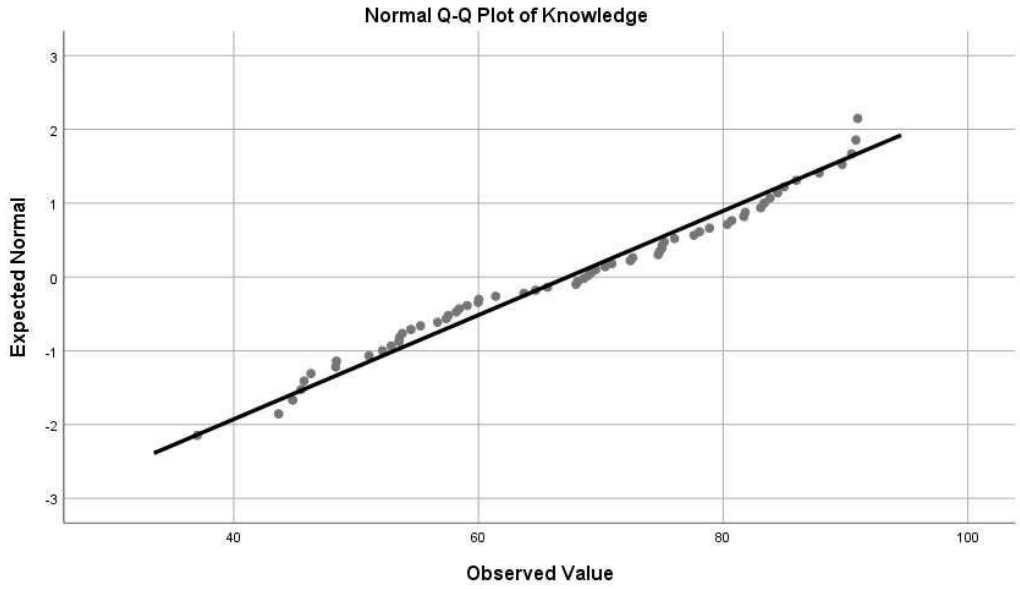
B.2.1 Knowledge Histogram



B.2.2 Knowledge boxplot



B.2.3 Knowledge Normal Q-Q Plot



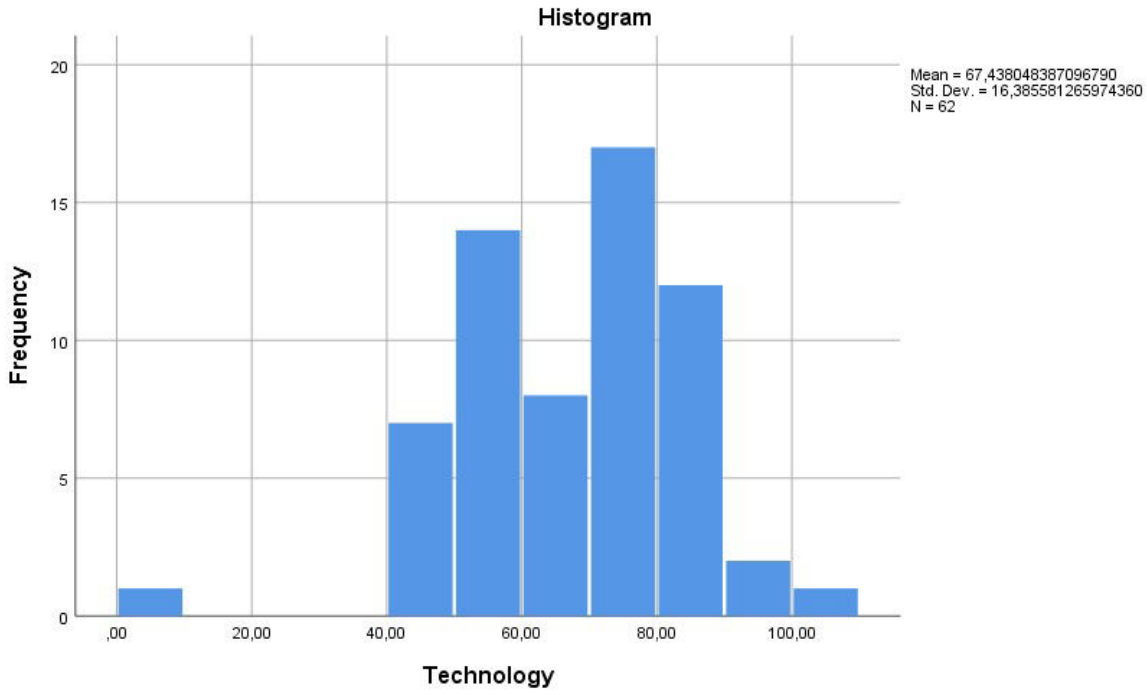
B.3 Technology descriptive statistics

Descriptives

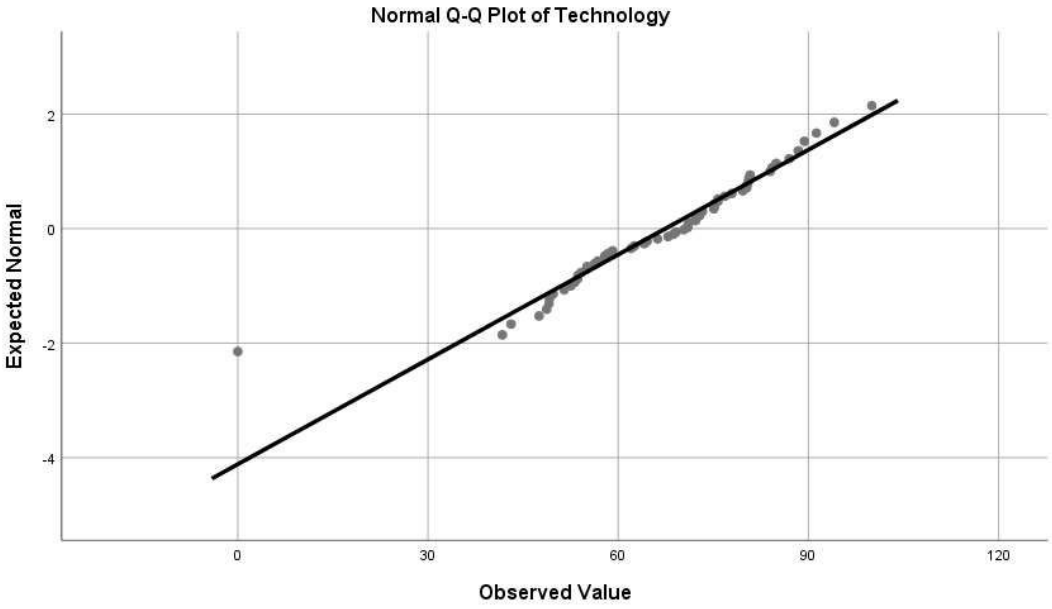
			Statistic	Std. Error
Technology	Mean		67.43804838 7096790	2.080970901 750686
	95% Confidence Interval for Mean	Lower Bound	63.27688989 2268684	
		Upper Bound	71.59920688 1924890	
	5% Trimmed Mean		68.05226702 5089590	
	Median		70.65250000 0000000	
	Variance		268.487	
	Std. Deviation		16.38558126 5974360	
	Minimum		.0000000000 00000	
	Maximum		100.0000000 00000000	
	Range		100.0000000 00000000	
	Interquartile Range		24.73650000 0000007	
	Skewness		-1.008	.304

	Kurtosis	3.275	.599

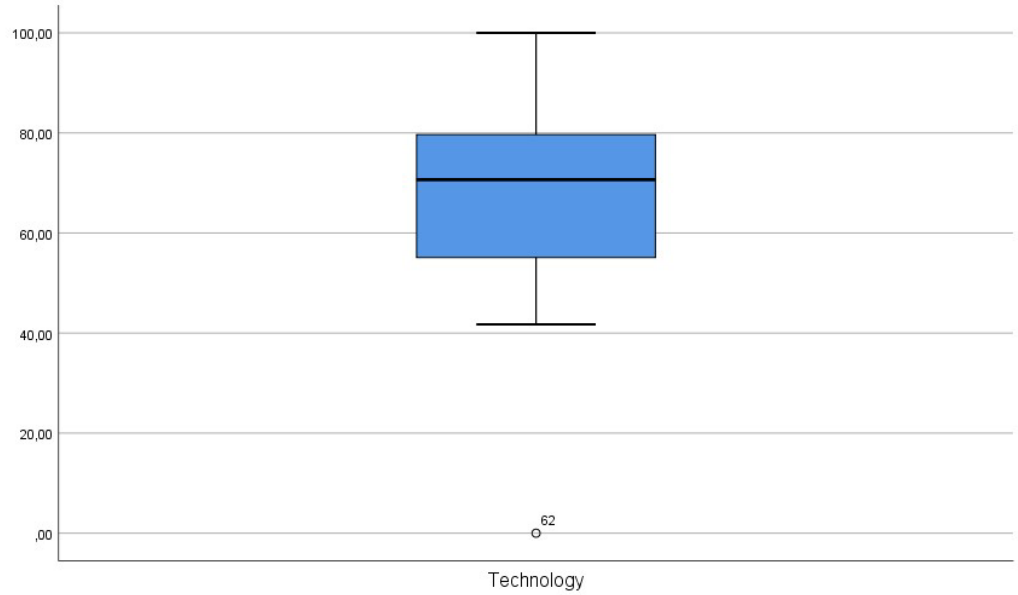
B.3.1 Technology Histogram



B.3.2 Technology Q-Q Plot



B.3.3 Technology Boxplot

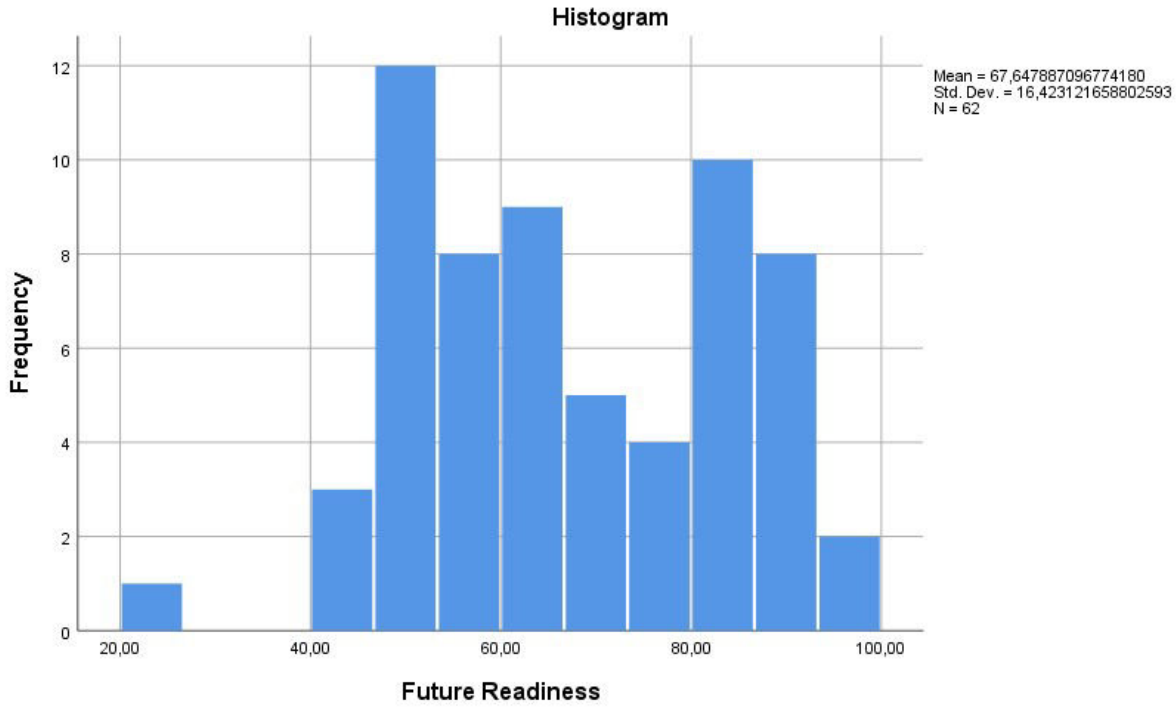


B.4 Future Readiness descriptive statistics

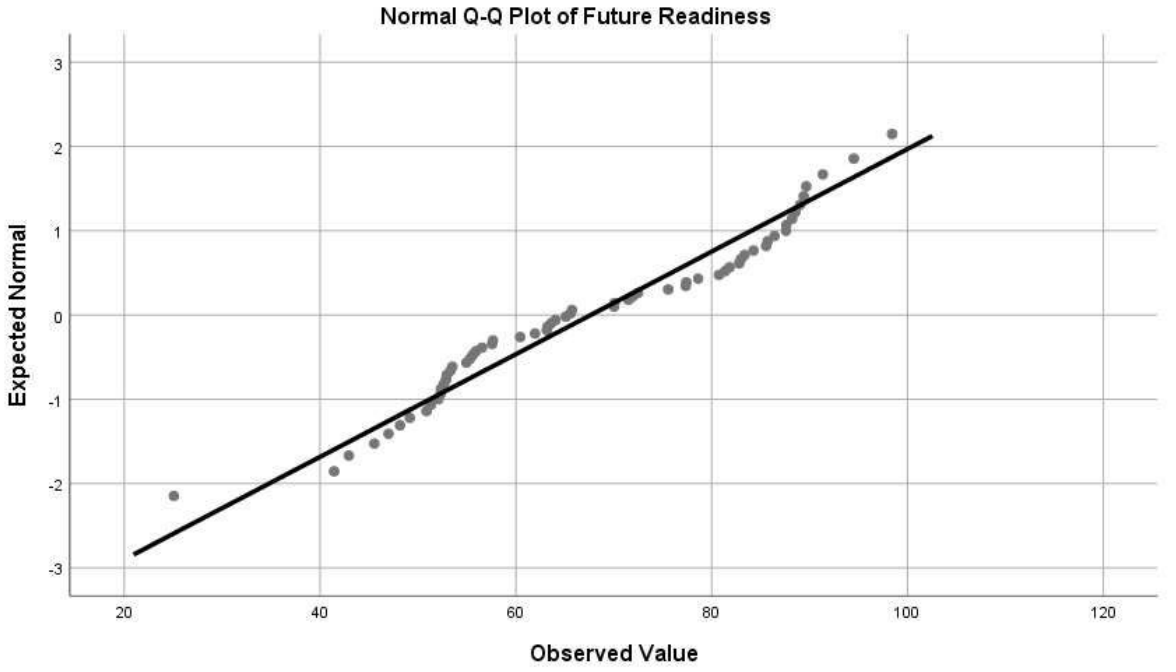
Descriptives

			Statistic	Std. Error
Future Readiness	Mean		67.64788709 6774170	2.0857385 36407509
	95% Confidence Interval for Mean	Lower Bound	63.47719512 7241650	
		Upper Bound	71.81857906 6306680	
	5% Trimmed Mean		67.86600537 6344090	
	Median		65.34700000 0000010	
	Variance		269.719	
	Std. Deviation		16.42312165 8802593	
	Minimum		25.06100000 0000000	
	Maximum		98.42700000 0000000	
	Range		73.36600000 0000010	
	Interquartile Range		29.86250000 0000010	
	Skewness		-.073	.304
	Kurtosis		-.840	.599

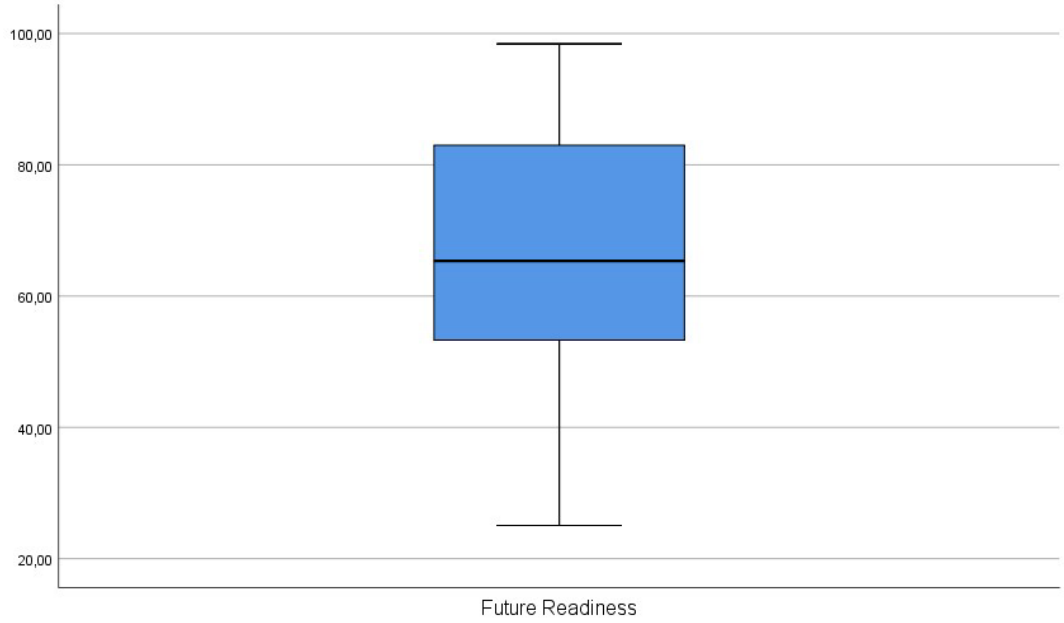
B.4.1 Future Readiness Histogram



B.4.2 Future Readiness Q-Q Plot



B.4.3 Future Readiness Box plot



Appendix C Final sample data (N=57)

C.1 Descriptive statistics

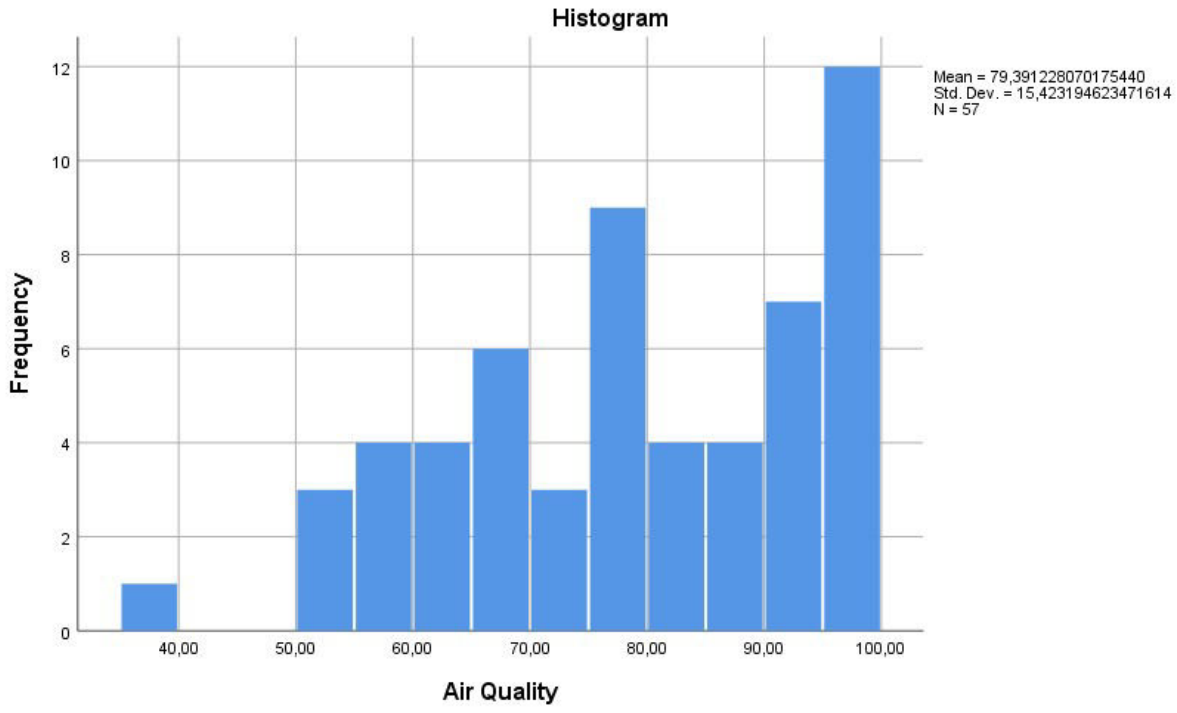
Descriptives

			Statistic	Std. Error
Air Quality	Mean		79.391228070175440	2.042852032809977
	95% Confidence Interval for Mean	Lower Bound	75.298903695470090	
		Upper Bound	83.483552444880800	
	5% Trimmed Mean		80.072690058479510	
	Median		79.910000000000000	
	Variance		237.875	
	Std. Deviation		15.423194623471616	
	Minimum		37.900000000000000	
	Maximum		99.610000000000000	
	Range		61.710000000000000	
	Interquartile Range		25.395000000000010	
	Skewness		-.471	.316
	Kurtosis		-.577	.623
Knowledge	Mean		67.701543859649120	1.831658960864754
	95% Confidence Interval for Mean	Lower Bound	64.032290046202930	
		Upper Bound	71.370797673095310	
	5% Trimmed Mean		67.700877192982450	
	Median		68.971000000000000	
	Variance		191.234	
	Std. Deviation		13.828721896408956	

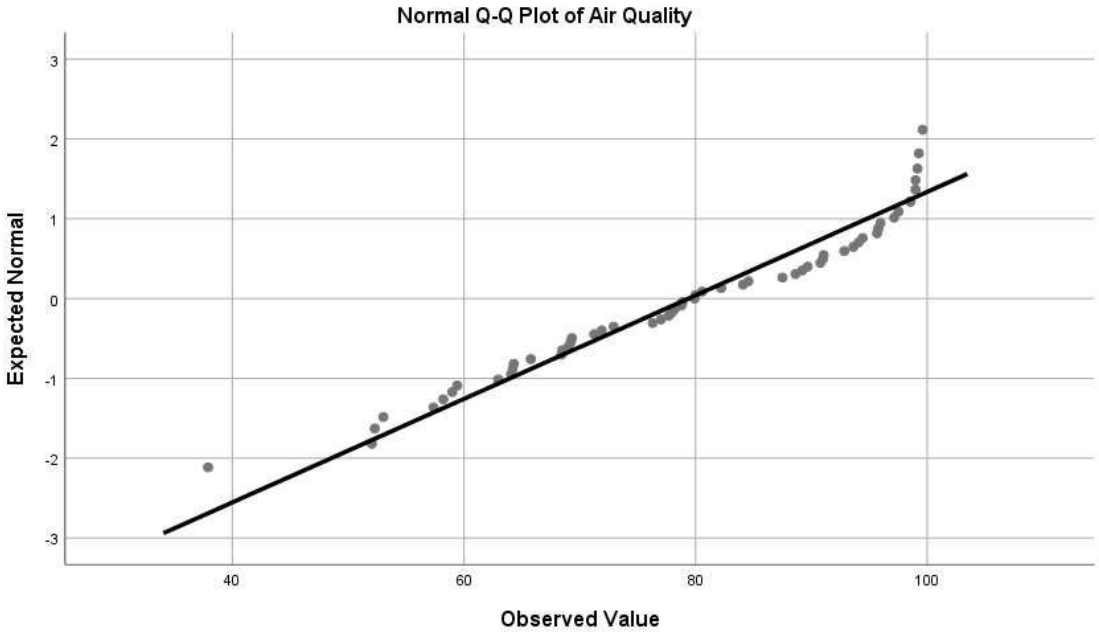
	Minimum		43.669000000000000	
	Maximum		90.998000000000000	
	Range		47.329000000000010	
	Interquartile Range		23.649999999999990	
	Skewness		-.033	.316
	Kurtosis		-1.119	.623
Technology	Mean		68.772280701754380	1.873525823614628
	95% Confidence Interval for Mean	Lower Bound	65.019157484077240	
		Upper Bound	72.525403919431530	
	5% Trimmed Mean		68.677633528265100	
	Median		70.976000000000000	
	Variance		200.076	
	Std. Deviation		14.144809778494709	
	Minimum		41.722000000000000	
	Maximum		100.00000000000000	
	Range		58.278000000000000	
	Interquartile Range		23.766000000000005	
	Skewness		.016	.316
	Kurtosis		-.825	.623
Future Readiness	Mean		68.213491228070180	2.068538551744174
	95% Confidence Interval for Mean	Lower Bound	64.069710572710390	
		Upper Bound	72.357271883429970	
	5% Trimmed Mean		68.118769005847950	

	Median	65.599000000000000	
	Variance	243.895	
	Std. Deviation	15.617123588643250	
	Minimum	41.430000000000000	
	Maximum	98.427000000000000	
	Range	56.997000000000010	
	Interquartile Range	30.051000000000002	
	Skewness	.126	.316
	Kurtosis	-1.291	.623

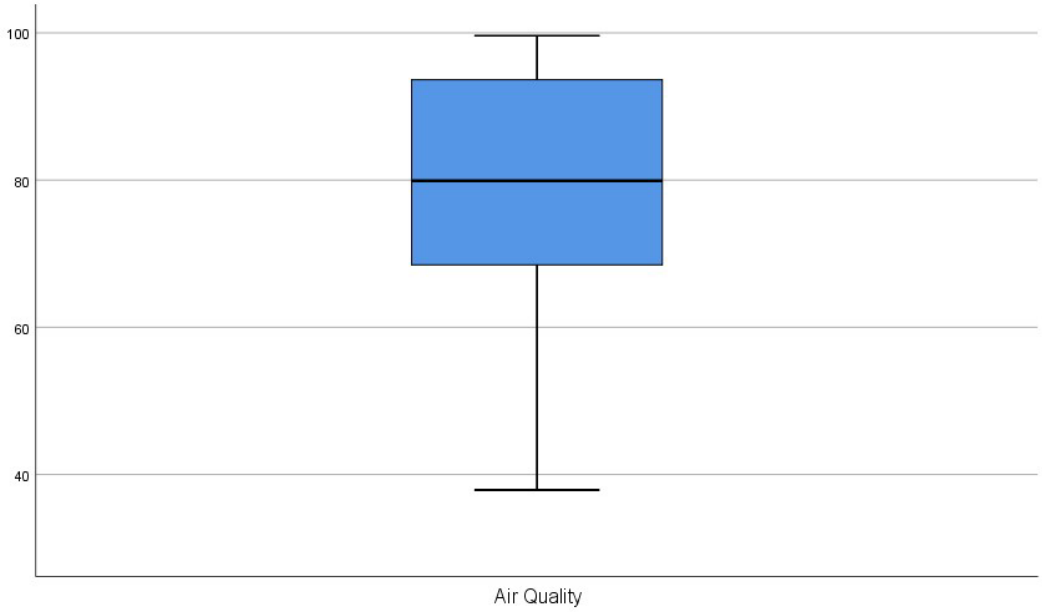
C.1.1 Air Quality histogram



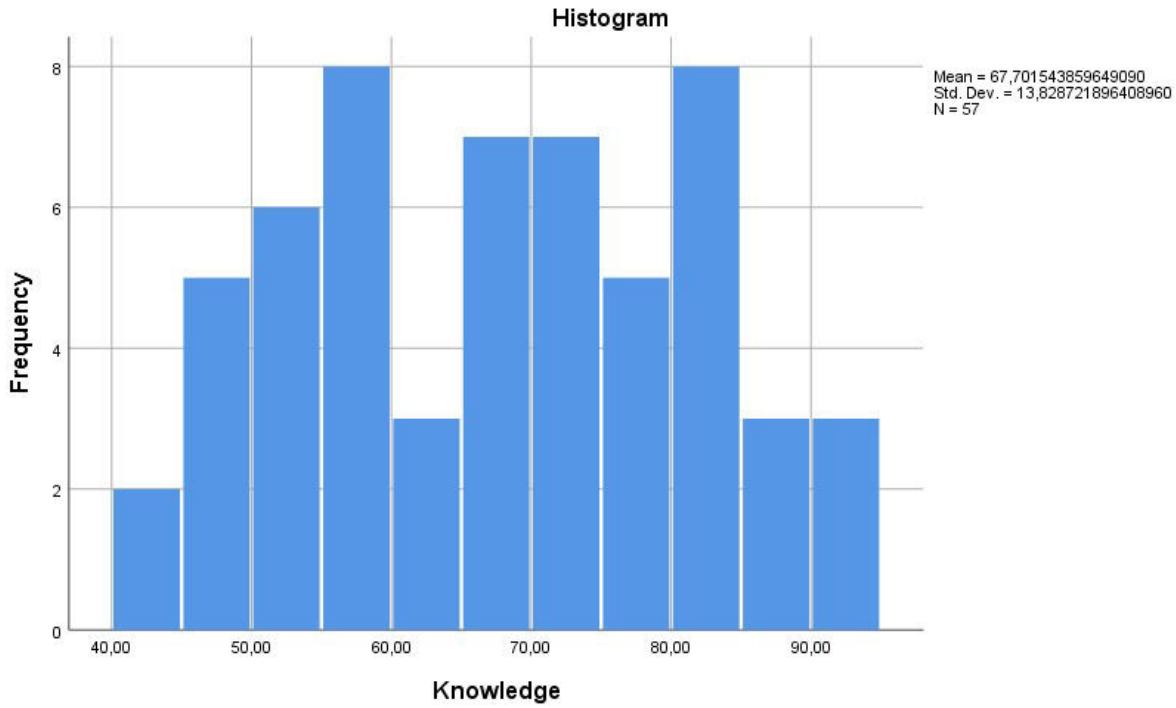
C.1.2 Air Quality Q-Q Plot



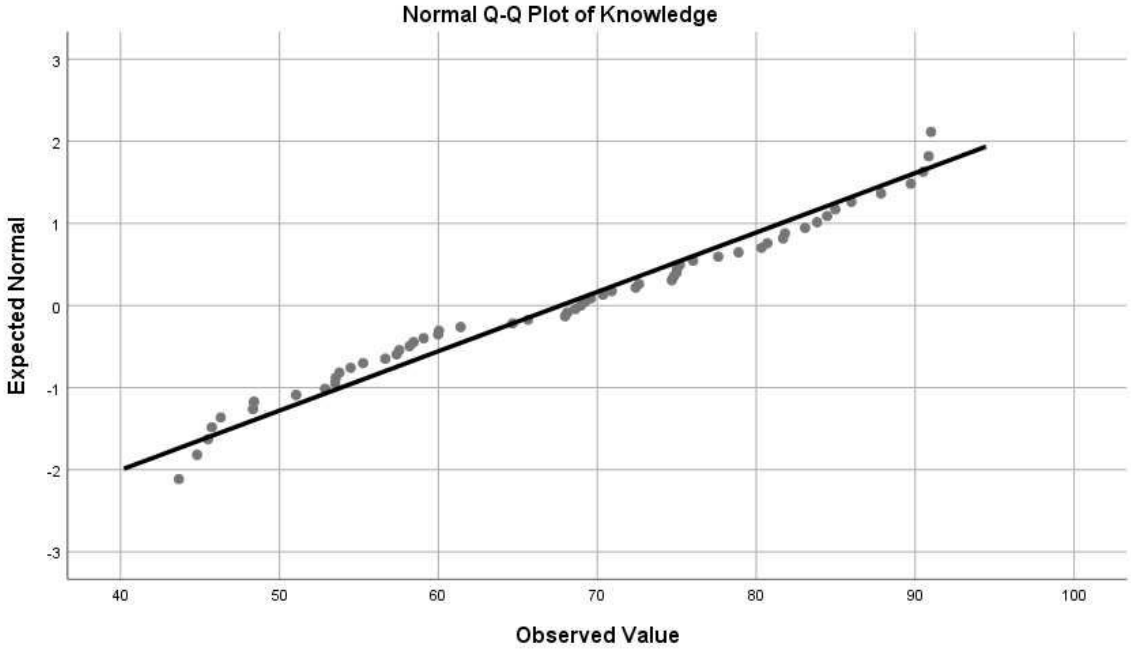
C.1.3 Air Quality box plot



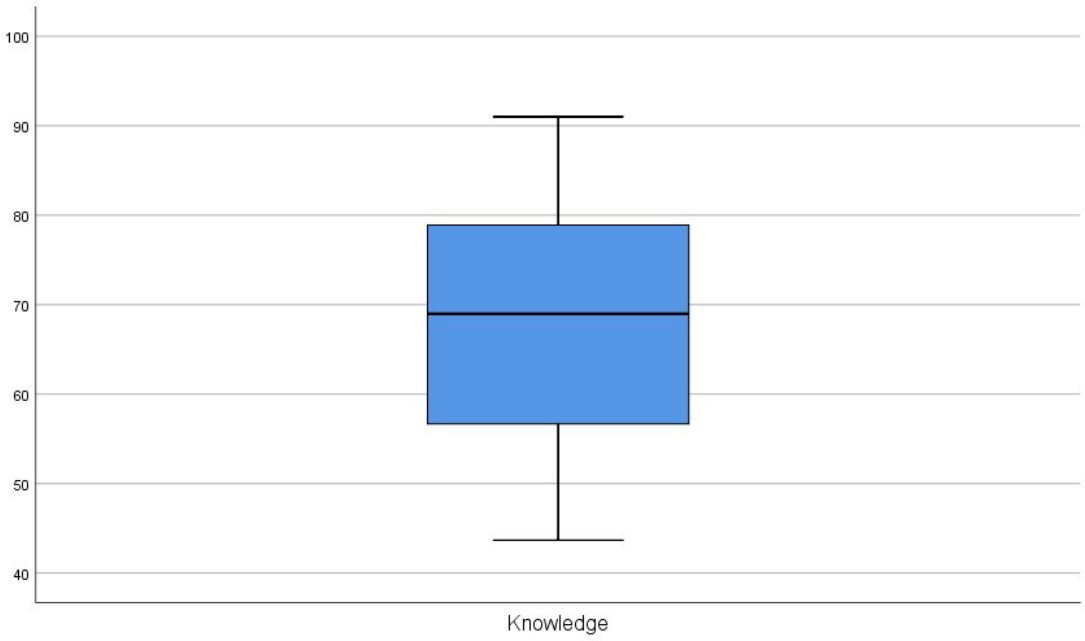
C.1.4 Knowledge histogram



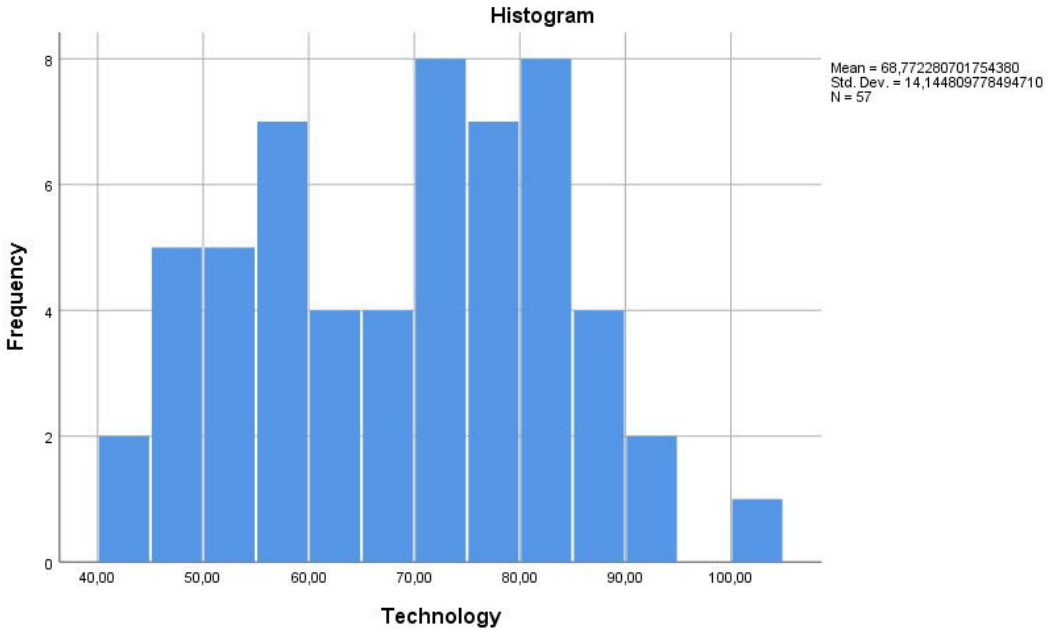
C.1.5 Knowledge Q-Q Plot



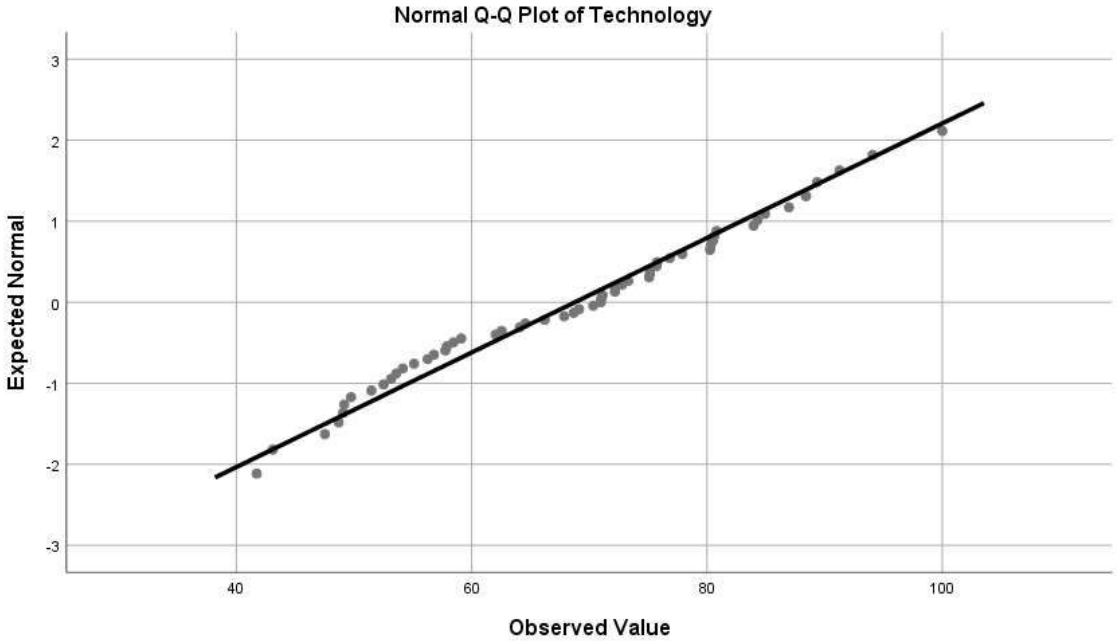
C.1.6 Knowledge box plot



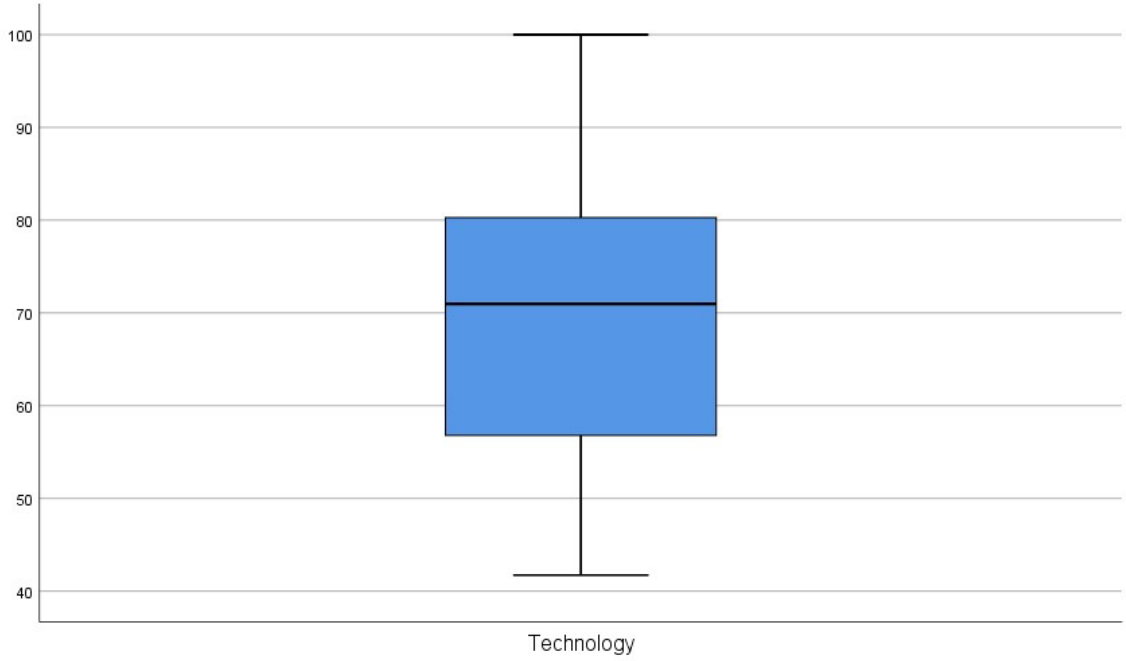
C.1.7 Technology histogram



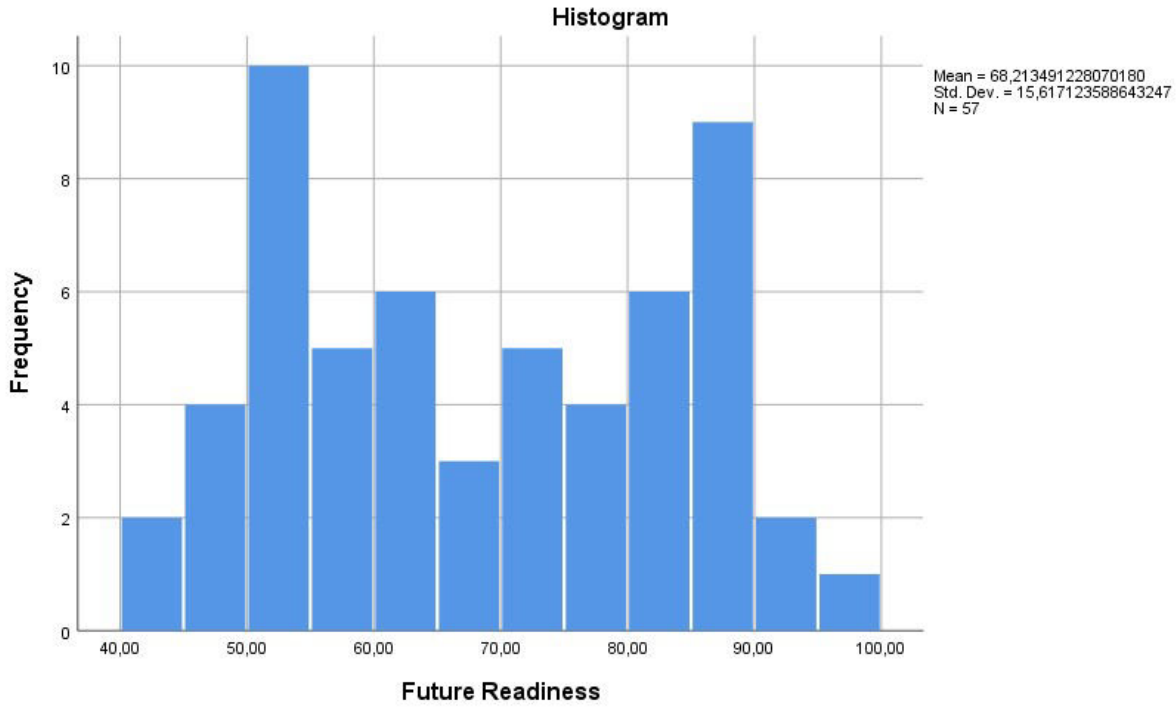
C.1.8 Technology Q-Q Plot



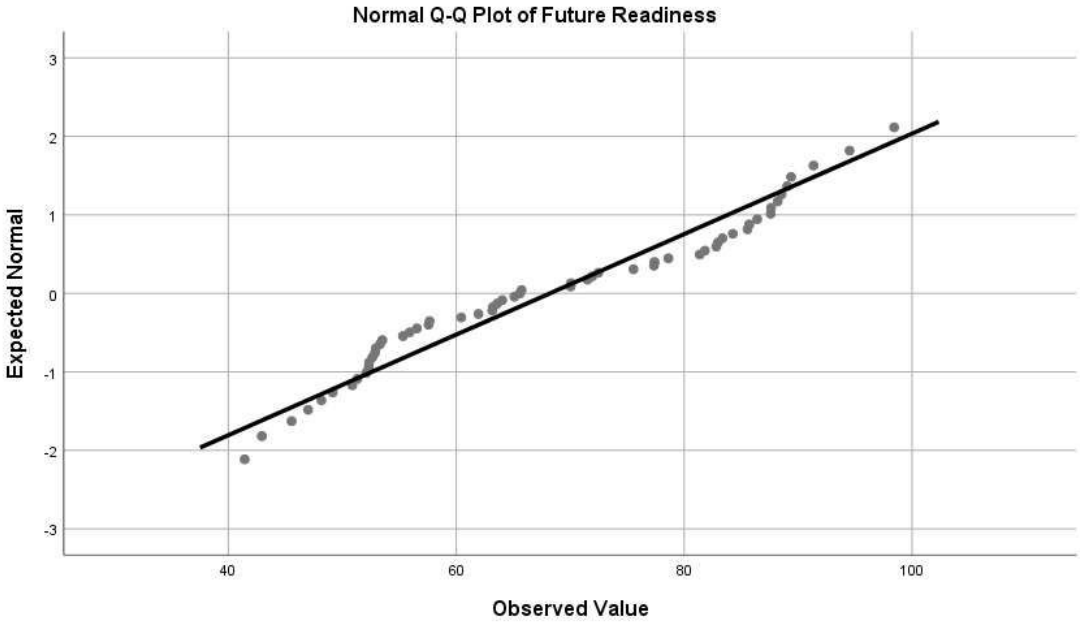
C.1.9 Technology box plot



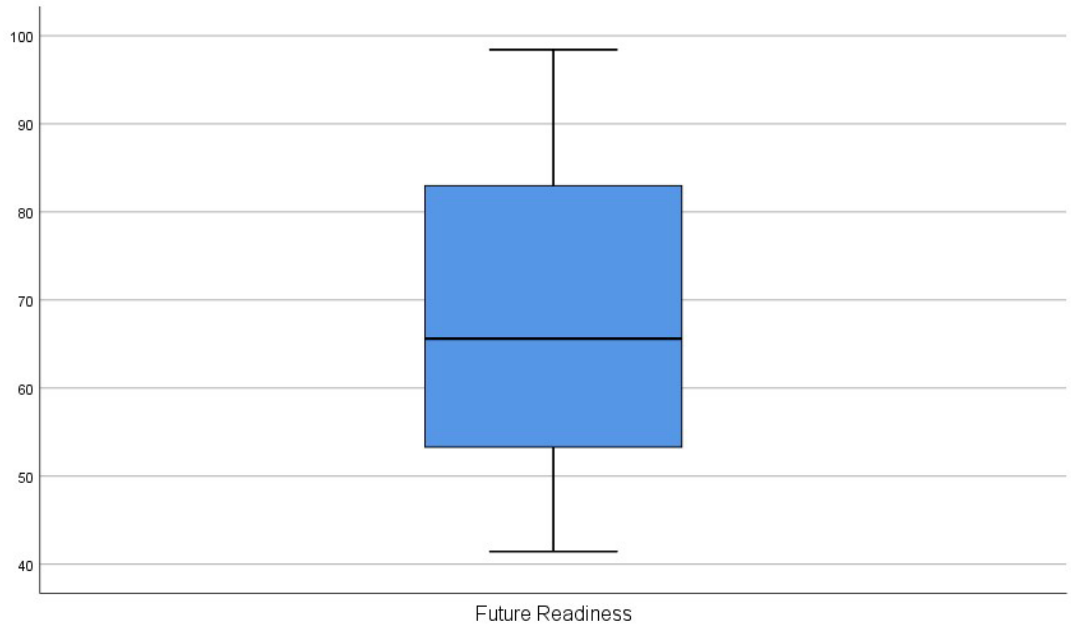
C.1.10 Future Readiness histogram



C.1.11 Future Readiness Q-Q Plot



C.1.12 Future Readiness box plot



C.2 Anova – Output with all variables

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Future Readiness, Knowledge, Technology[b]	.	Enter

a. Dependent Variable: Air Quality

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.708[a]	.501	.473	11.20043094 8860648	1.961

a. Predictors: (Constant), Future Readiness, Knowledge, Technology

b. Dependent Variable: Air Quality

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6672.165	3	2224.055	17.729	.000[b]
	Residual	6648.832	53	125.450		
	Total	13320.996	56			

a. Dependent Variable: Air Quality

b. Predictors: (Constant), Future Readiness, Knowledge, Technology

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	46.605	7.775		5.994	.000
	Knowledge	.223	.228	.200	.980	.331
	Technology	-.851	.240	-.780	-3.544	.001
	Future Readiness	1.117	.223	1.131	5.003	.000

a. Dependent Variable: Air Quality

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	56.756607055664060	101.724273681640620	79.391228070175440	10.915392622433469	57
Residual	-25.258769989013672	27.595924377441406	-.000000000000041	10.896290024206110	57
Std. Predicted Value	-2.074	2.046	.000	1.000	57
Std. Residual	-2.255	2.464	.000	.973	57

a. Dependent Variable: Air Quality

C.3 Anova - Output (Knowledge excluded)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Future Readiness, Technology[b]	.	Enter

a. Dependent Variable: Air Quality

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.701[a]	.492	.473	11.196365824067145	1.989

a. Predictors: (Constant), Future Readiness, Technology

b. Dependent Variable: Air Quality

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6551.631	2	3275.816	26.132	.000[b]
	Residual	6769.365	54	125.359		
	Total	13320.996	56			

a. Dependent Variable: Air Quality

b. Predictors: (Constant), Future Readiness, Technology

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	48.840	7.430		6.573	.000		
	Technology	-.760	.221	-.697	-3.434	.001	.229	4.372
	Future Readiness	1.214	.200	1.229	6.058	.000	.229	4.372

a. Dependent Variable: Air Quality

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Technology	Future Readiness
1	1	2.966	1.000	.00	.00	.00
	2	.028	10.223	.93	.03	.09
	3	.005	23.639	.07	.97	.91

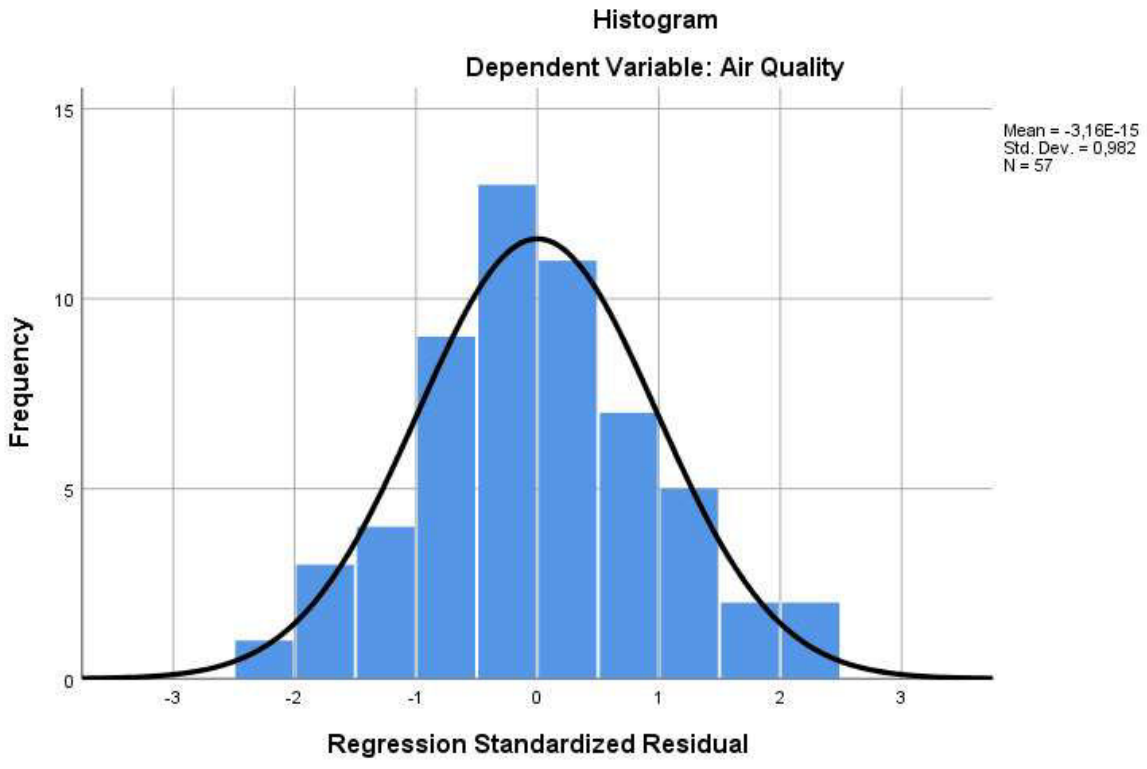
a. Dependent Variable: Air Quality

Residuals Statistics[a]

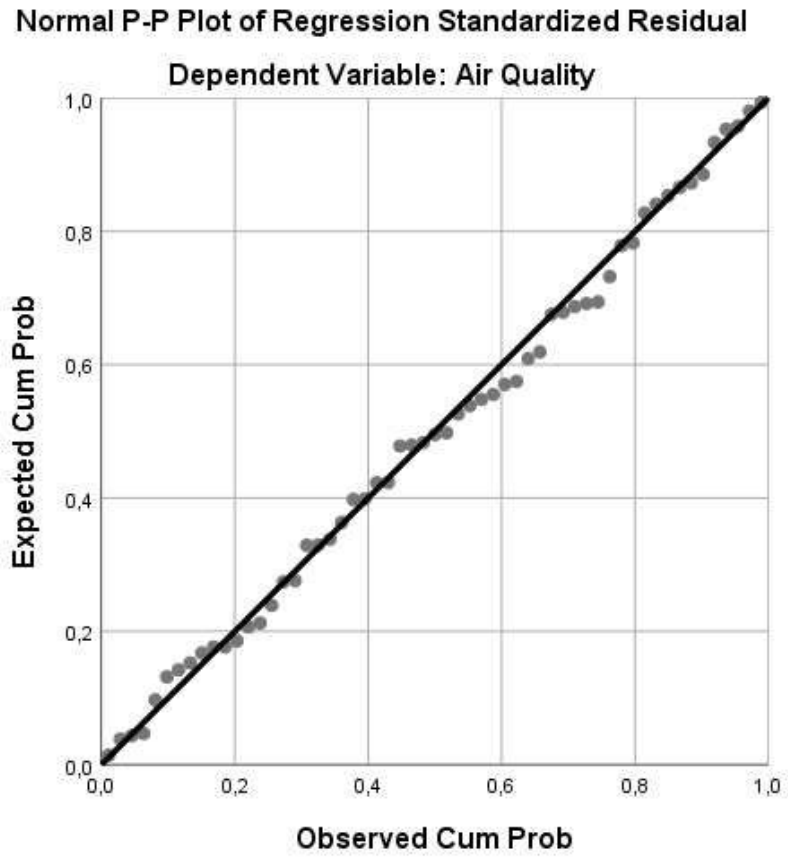
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	56.97263717651367	102.49525451660156	79.39122807017546	10.816349562495052	57
Residual	-24.51952171325684	27.604610443115234	-.00000000000000036	10.994612977972357	57
Std. Predicted Value	-2.073	2.136	.000	1.000	57
Std. Residual	-2.190	2.465	.000	.982	57

a. Dependent Variable: Air Quality

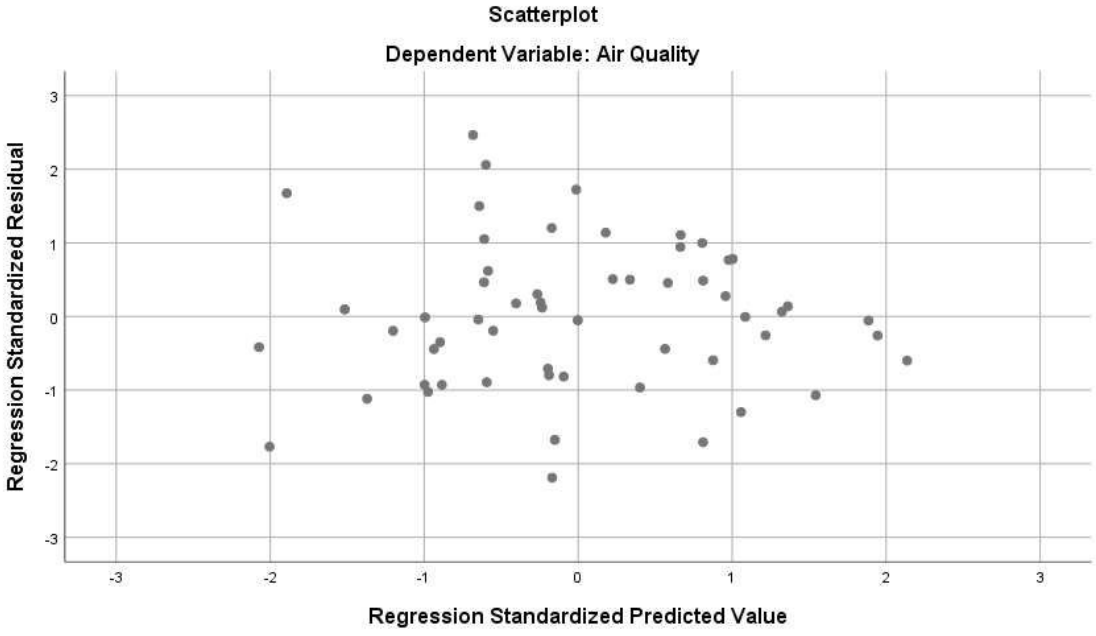
C.4 Histogram



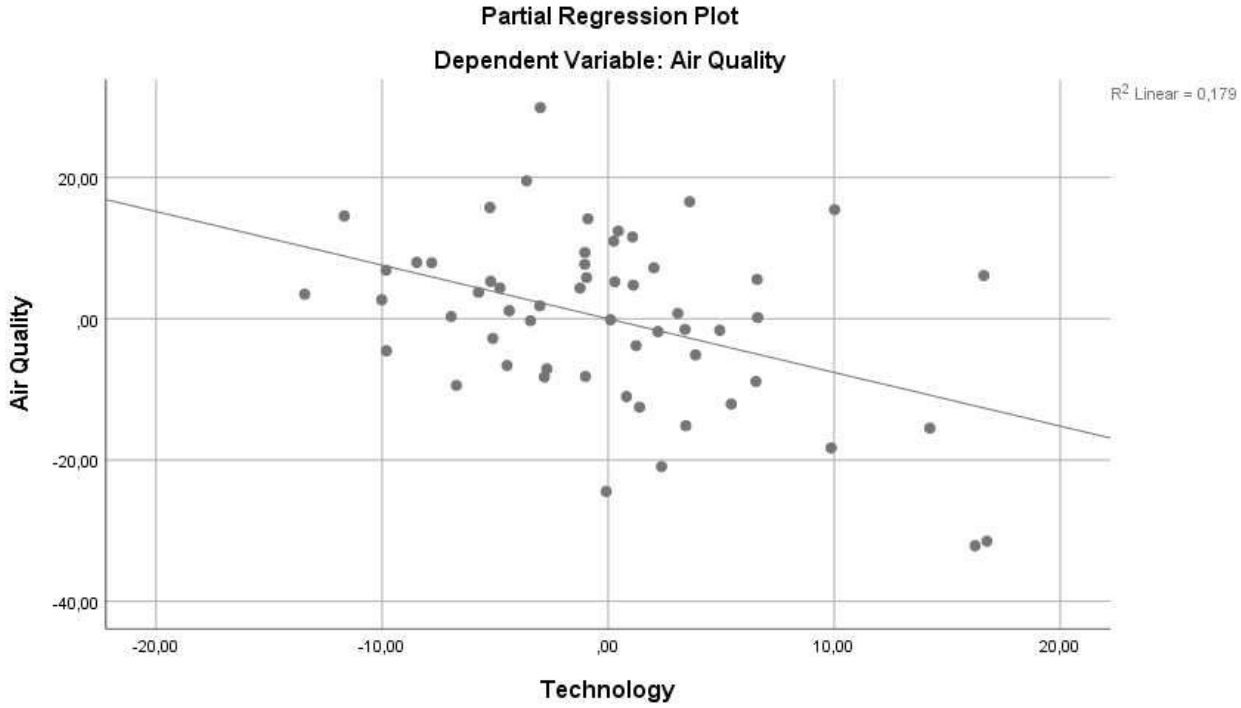
C.5 P-P Plot of Regression Standardized residuals

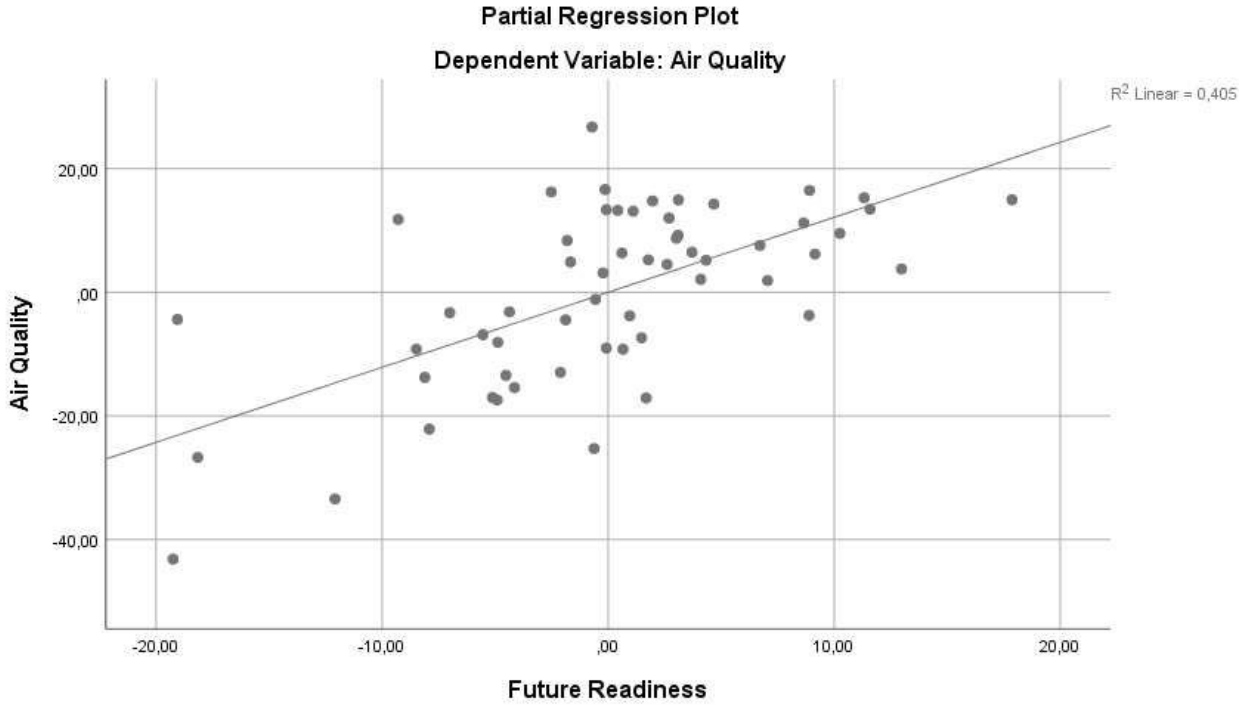


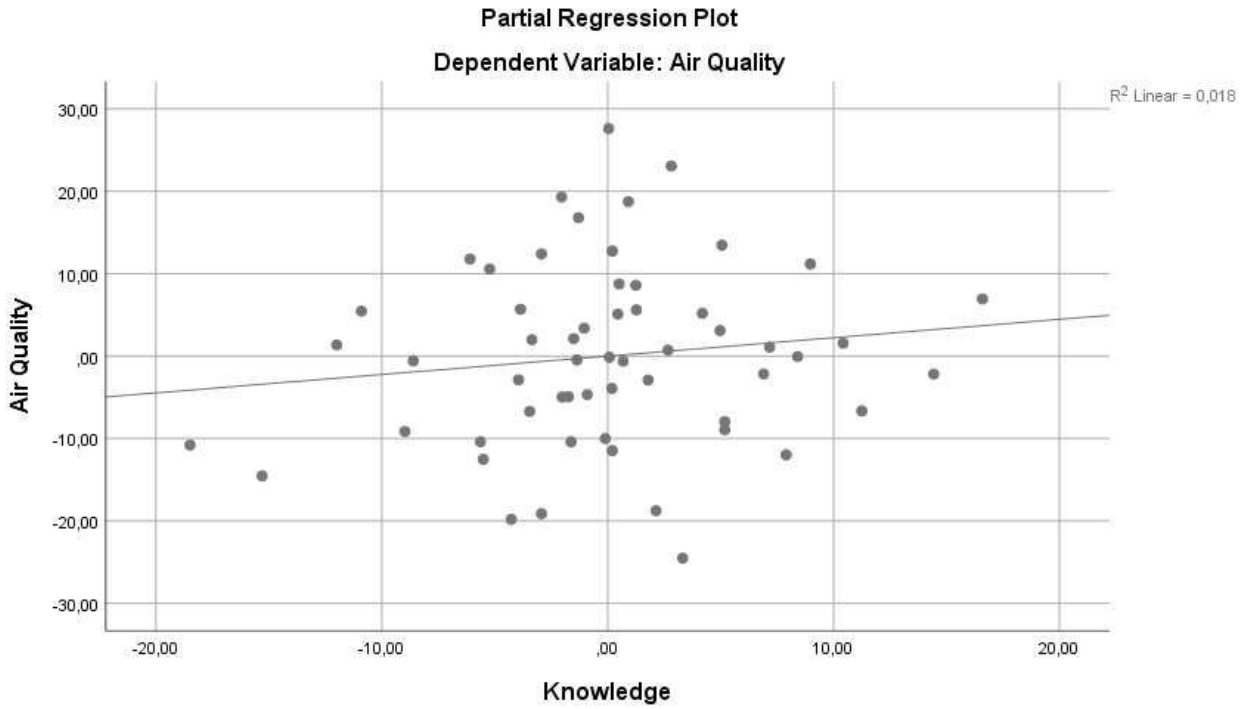
C.6 Scatterplot



C.7 Partial Regression Plots







C.8 Tests of Between-Subjects Effects

Tests of Between-Subjects Effects

Dependent Variable: Air Quality

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6551.631[a]	2	3275.816	26.132	.000
Intercept	5416.098	1	5416.098	43.205	.000
Technology	1478.288	1	1478.288	11.792	.001
FutureReadiness	4601.022	1	4601.022	36.703	.000
Error	6769.365	54	125.359		
Total	372590.121	57			
Corrected Total	13320.996	56			

a. R Squared = .492 (Adjusted R Squared = .473)

C.9 Breusch-Pagan Test

Breusch-Pagan Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
2.640	1	.104

a. Dependent variable: Air Quality

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

c. Predicted values from design: Intercept + Technology + FutureReadiness

C.10 Ramsey reset test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	44.079	8.230		5.356	.000
	Technology	-1.598	.677	-1.465	-2.359	.022
	Future Readiness	2.586	1.068	2.619	2.422	.019
	ram2	-5.919E-5	.000	-.814	-1.308	.196

a. Dependent Variable: Air Quality

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	ram1	.195[b]	.008	.994	.001	1.662E-5

a. Dependent Variable: Air Quality

b. Predictors in the Model: (Constant), ram2, Technology, Future Readiness

Appendix D Robustness check (N=46)

D.1 Descriptive statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Air Quality	80.882608695652150	15.826323421549247	46
Technology	73.155695652173930	11.983095771163210	46
Future Readiness	72.161260869565200	14.712992727419580	46

D.2 Anova-Output

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Future Readiness, Technology[b]	.	Enter

a. Dependent Variable: Air Quality

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.690[a]	.476	.451	11.723347341263342	2.008

a. Predictors: (Constant), Future Readiness, Technology

b. Dependent Variable: Air Quality

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5361.478	2	2680.739	19.505	.000[b]
	Residual	5909.786	43	137.437		
	Total	11271.263	45			

a. Dependent Variable: Air Quality

b. Predictors: (Constant), Future Readiness, Technology

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	48.916	10.831		4.516	.000		
	Technology	-.700	.268	-.530	-2.609	.012	.296	3.381
	Future Readiness	1.152	.218	1.071	5.275	.000	.296	3.381

a. Dependent Variable: Air Quality

D.3 Collinearity Diagnostics

Collinearity Diagnostics[a]

				Variance Proportions		
Model	Dimension	Eigenvalue	Condition Index	(Constant)	Technology	Future Readiness
1	1	2.974	1.000	.00	.00	.00
	2	.021	11.948	.76	.02	.18
	3	.005	24.973	.23	.98	.82

a. Dependent Variable: Air Quality

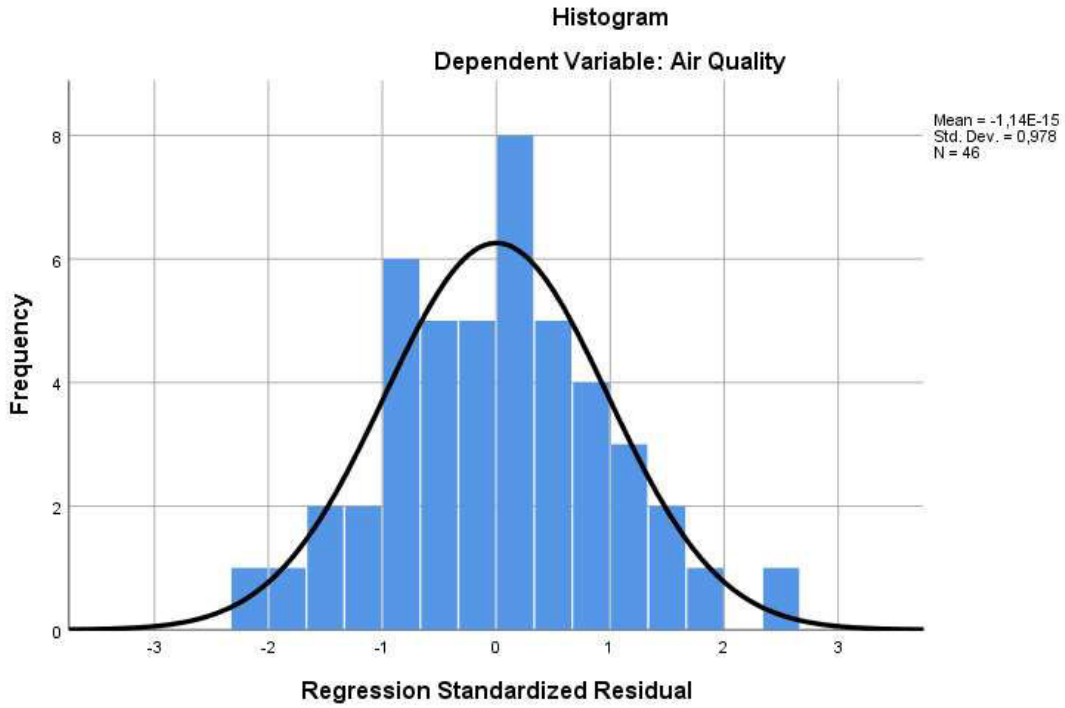
D.4 Residuals Statistics

Residuals Statistics[a]

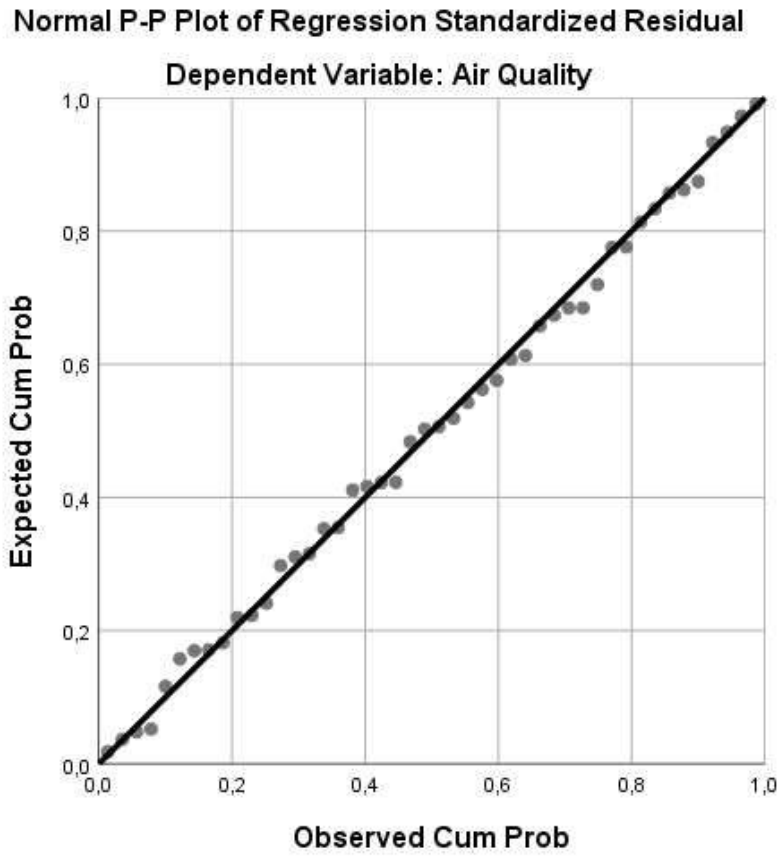
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	58.095417022705080	101.410163879394530	80.882608695652200	10.915307857366045	46
Residual	-24.566192626953125	27,557504653930664	-.000000000000013	11.459867687822554	46
Std. Predicted Value	-2.088	1.881	.000	1.000	46
Std. Residual	-2.095	2.351	.000	.978	46

a. Dependent Variable: Air Quality

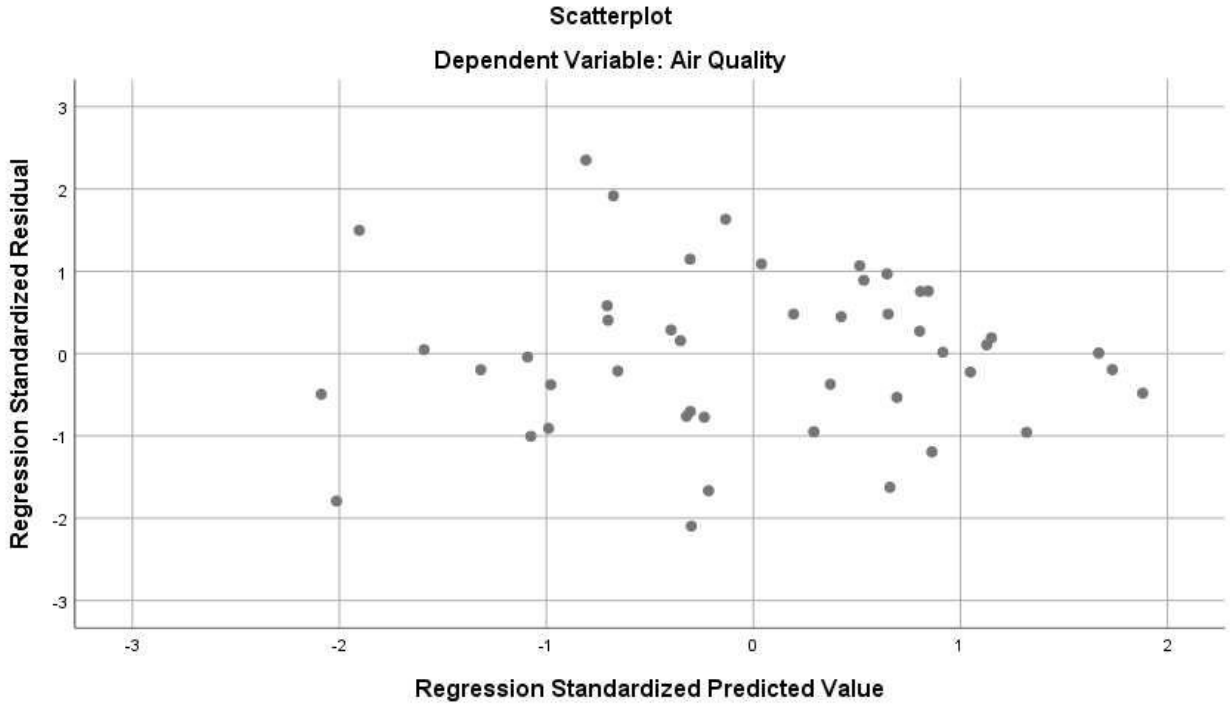
D.5 Histogram



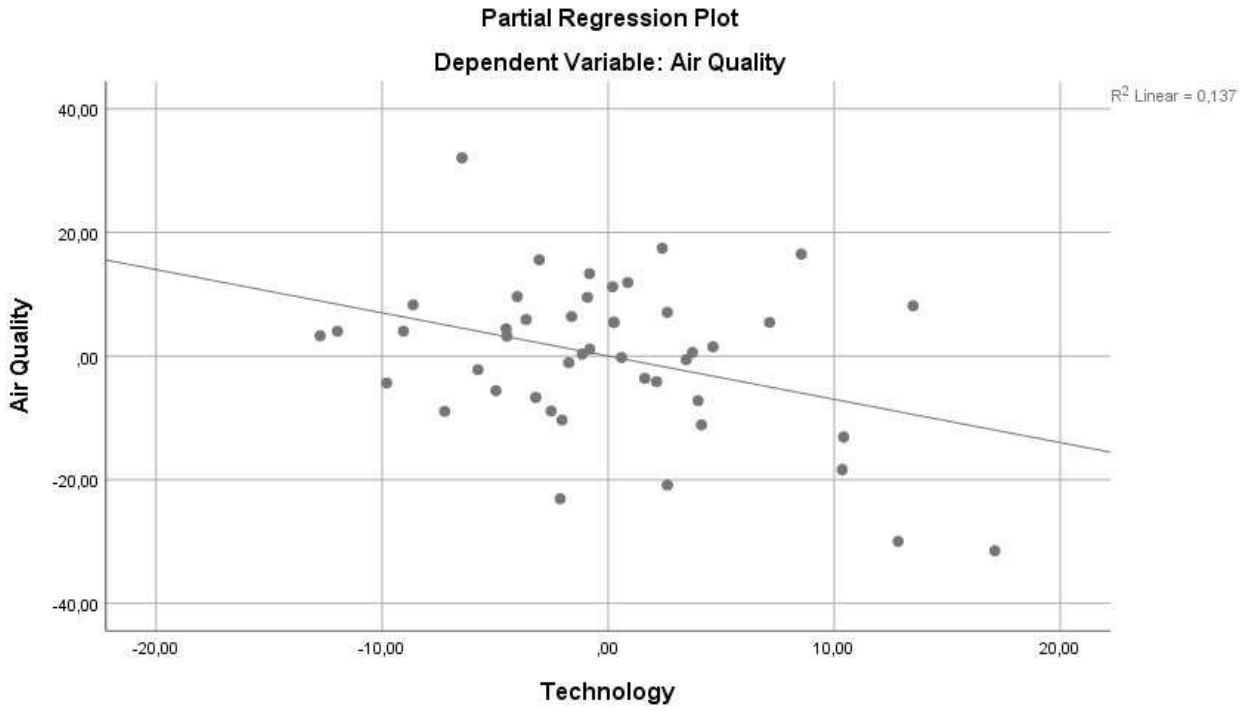
D.6 Normal P-P Plot

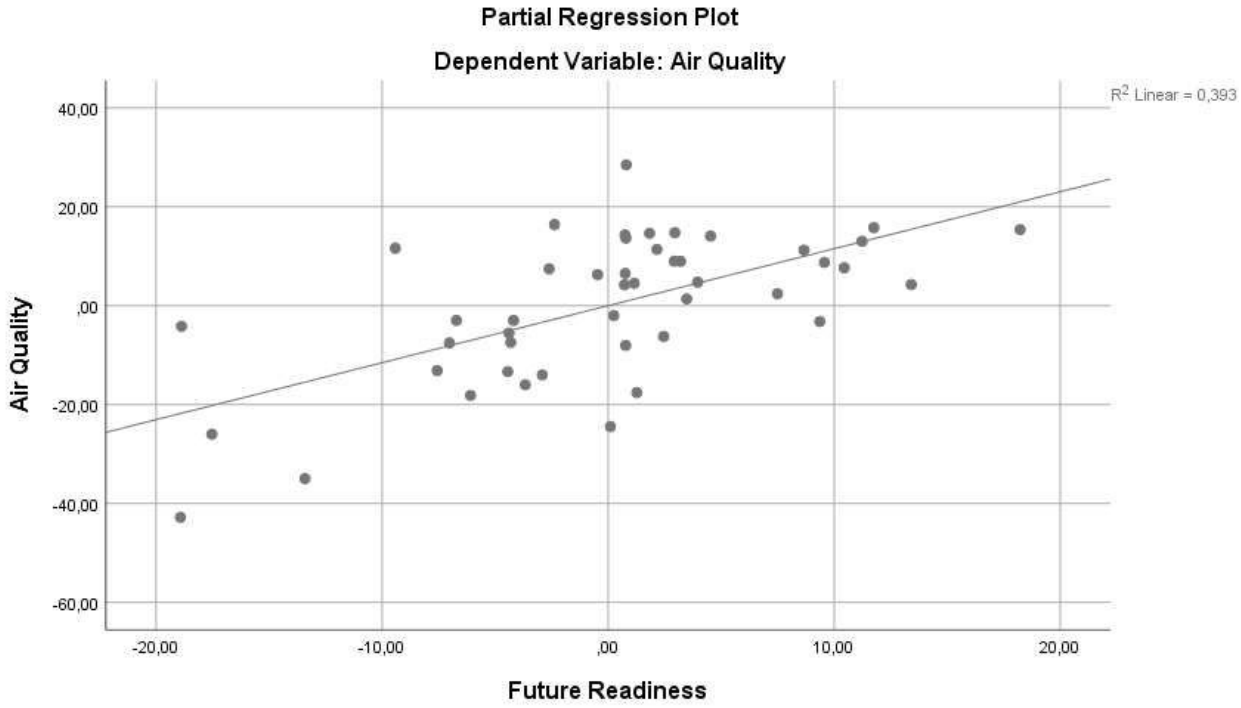


D.7 Scatterplot



D.8 Partial Regression Plots





D.9 Breusch-Pagan Test

Breusch-Pagan Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
3.115	1	.078

a. Dependent variable: Air Quality

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

c. Predicted values from design: Intercept + Technology + FutureReadiness

D.10 Tests of Between-Subjects Effects

Tests of Between-Subjects Effects

Dependent Variable: Air Quality

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5361.478[a]	2	2680.739	19.505	.000
Intercept	2803.364	1	2803.364	20.397	.000
Technology	935.422	1	935.422	6.806	.012
FutureReadiness	3824.939	1	3824.939	27.831	.000
Error	5909.786	43	137.437		
Total	312203.097	46			
Corrected Total	11271.263	45			

a. R Squared = .476 (Adjusted R Squared = .451)