Analysis Report

This report is structured as follows.

Contents

Sample Characterization

The following table shows the frequencies of sample respondents regarding organization size, country, years of work experience, education level and age.

		Count	Column N %
Size of your organisation (employees number):	1 – 49	40	11.1%
	1,000 - 4,999	85	23.5%
	250 - 999	91	25.2%
	5,000 or more	73	20.2%
	50 – 249	72	19.9%
In which country are you based as an organisation?	Albania	1	0.3%
	Andorra	2	0.6%
	Angola	6	1.7%
	Antigua and Barbuda	2	0.6%
	Argentina	3	0.8%
	Armenia	7	1.9%
	Australia	27	7.5%
	Austria	2	0.6%
	Azerbaijan	1	0.3%
	Bahrain	1	0.3%
	Belarus	1	0.3%
	Belgium	1	0.3%
	Bosnia and Herzegovina	1	0.3%
	Canada	28	7.8%
	China	58	16.1%
	Denmark	1	0.3%
	Finland	1	0.3%
	Germany	22	6.1%
	Ghana	1	0.3%
	Grenada	1	0.3%
	India	35	9.7%
	Japan	24	6.6%
	Mexico	1	0.3%
	Moldova	1	0.3%
	San Marino	1	0.3%
	Singapore	1	0.3%
	Sweden	41	11.4%
	The Gambia	1	0.3%
	Tunisia	1	0.3%
	United Kingdom	27	7.5%
	United States	60	16.6%
	Vatican City	1	0.3%
Your total years of work experience:	0 – 2	23	6.4%
	nov/19	69	19.1%
	20 or above	42	11.6%
	3 – 5	85	23.5%
	6 – 10	142	39.3%
Your educational level:	College degree	57	15.8%
	Doctorate or above	54	15.0%
	High school graduate or Less	37	10.2%

	Higher Diploma/Bachelor degree	96	26.6%
	Masters	117	32.4%
Your age:	25 – 30	73	20.2%
	31 – 40	208	57.6%
	41 – 50	41	11.4%
	51 or above	21	5.8%
	Less than 24	18	5.0%

Descriptive Statistics

The table below shows descriptive statistics for all variables under study. Skewness was within ±1.5 range and so was kurtosis, suggesting normality. No missing values were present in the dataset and the total sample size was 361 (N = 361).

Descriptive Statistics

	N	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
BTC1	361	1	5	3.931	1.032	-0.990	0.688
BTC2	361	1	5	4.022	1.003	-1.076	0.966
BTC3	361	1	5	3.975	0.979	-1.005	0.997
BTC4	361	1	5	4.011	0.922	-0.899	0.795
BTC5	361	1	5	4.025	0.981	-1.061	0.949
BTC6	361	1	5	4.028	1.000	-1.046	0.855
BTC7	361	1	5	3.972	0.977	-0.932	0.569
BTC8	361	1	5	4.047	0.928	-0.995	1.040
CCG1	361	1	5	3.778	1.116	-0.869	0.097
CCG2	361	1	5	4.003	0.938	-1.101	1.290
CCG3	361	1	5	3.956	0.956	-1.022	1.044
CCG4	361	1	5	3.997	0.987	-1.091	1.250
CCG5	361	1	5	3.911	1.013	-1.048	0.973
CRG1	361	1	5	3.745	1.134	-0.730	-0.212
CRG2	361	1	5	3.997	0.990	-1.013	0.785
CRG3	361	1	5	3.997	0.938	-1.110	1.395
CRG4	361	1	5	4.064	0.974	-1.162	1.307
ASS1	361	1	5	3.806	1.114	-0.995	0.504
ASS2	361	1	5	4.000	0.960	-0.908	0.548
ASS3	361	1	5	3.934	0.917	-0.847	0.745
ASS4	361	1	5	4.006	0.955	-0.994	0.931
ASS5	361	1	5	4.042	0.929	-1.088	1.351
ASS6	361	1	5	4.025	0.961	-0.936	0.669
ASS7	361	1	5	3.950	1.002	-0.901	0.490
TRN1	361	1	5	3.823	1.109	-0.849	0.121
TRN2	361	1	5	4.091	0.919	-1.003	0.816
TRN3	361	1	5	3.994	0.931	-0.965	0.968

TRN4	361	1	5	4.091	0.907	-1.036	1.091
TRN5	361	1	5	4.053	0.949	-1.106	1.309
TRN6	361	1	5	4.091	0.949	-1.047	0.978
TRN7	361	1	5	4.111	0.954	-1.169	1.317
TRP1	361	1	5	3.884	1.061	-1.128	0.982
TRP2	361	1	5	4.091	0.907	-1.103	1.370
TRP3	361	1	5	4.075	0.920	-1.138	1.445
TRP4	361	1	5	4.080	0.984	-1.146	1.043
FLX1	361	1	5	3.925	1.034	-1.047	0.764
FLX2	361	1	5	4.053	0.866	-0.979	1.325
FLX3	361	1	5	4.019	0.959	-0.990	0.728
SOL1	361	1	5	3.903	1.080	-1.058	0.614
SOL2	361	1	5	4.116	0.874	-0.981	1.070
SOL3	361	1	5	4.066	0.898	-1.056	1.234
SOL4	361	1	5	4.144	0.923	-1.229	1.630
PGE1	361	1	5	3.939	1.089	-1.022	0.529
PGE2	361	1	5	4.105	0.866	-0.876	0.740
PGE3	361	1	5	4.058	0.916	-0.945	0.823
PGE4	361	1	5	4.064	0.936	-0.924	0.705
PGE5	361	1	5	4.089	0.947	-0.986	0.666
PGE6	361	1	5	4.072	1.006	-1.101	0.857
PGE7	361	1	5	4.058	0.937	-0.973	0.738
PGE8	361	1	5	4.100	0.892	-0.976	0.937
PGE9	361	1	5	4.080	0.914	-0.994	0.937
PGE10	361	1	5	4.091	0.894	-0.907	0.742
PER1	361	1	5	3.942	1.080	-0.949	0.267
PER2	361	1	5	4.094	0.886	-0.835	0.277
PER3	361	1	5	4.086	0.989	-1.039	0.676
PER4	361	1	5	4.105	0.894	-0.888	0.455
PER5	361	1	5	4.042	0.989	-0.966	0.468

The test of the Measurement Model (Confirmatory Factor Analysis)

The main objective of testing a measurement model is to test construct validity. Construct Validity is defined as “the extent to which a set of measured variables actually represent the theoretical latent construct they are designed to measure” (Hair et al., 2014). Confirmatory Factor Analysis (CFA) was used in the analysis, as it is an adequate method to be used as evidence of construct validity of theory-based instruments (Li, 2016). This type of analysis is used when a researcher wishes to confirm a specific pattern of variables that are predicted based on theory or previous analytical studies (DeVellis, 2012). That is, based on knowledge of the theory, he or she assumes the a priori factorial structure and then tests this hypothetical arrangement statistically (Byrne, 2016).

CFA was conducted using SPSS AMOS software v22, which uses Maximum Likelihood (ML) algorithm to estimate the results. ML is the most common method used to estimate parameters in CFA, because of its attractive statistical properties (i.e., asymptotic unbiasedness, normality, consistency, and maximal efficiency) (Li, 2016). After defining the model in the software and executing the analysis, four main phases were conducted to examine construct validity (1) assessment of model fit; (2) assessment of convergent validity; and (3) respecification of the model (if necessary). The statistics that were used to assess model fit and their rules of thumb are presented in the table below.

Fit index	**Rules of thumb**
Normed chi-square (χ^2/df)	The division between the chi-square value and the model's degrees of freedom should be less than 4.
Root mean square error of approximation (RMSEA)	RMSEA < 0.08
Comparative fit index (CFI)	CFI > 0.90
Normed fit index (NFI)	NFI > 0.90

Convergent validity refers to the "extent to which indicators of a specific construct converge or share a high proportion of variance in common" (Hair et al. 2014, p. 601). A second important concept to test is construct's reliability. This was done using the Composite Reliability index (which is based on factor loadings) and Cronbach's Alpha (which is based on correlations).

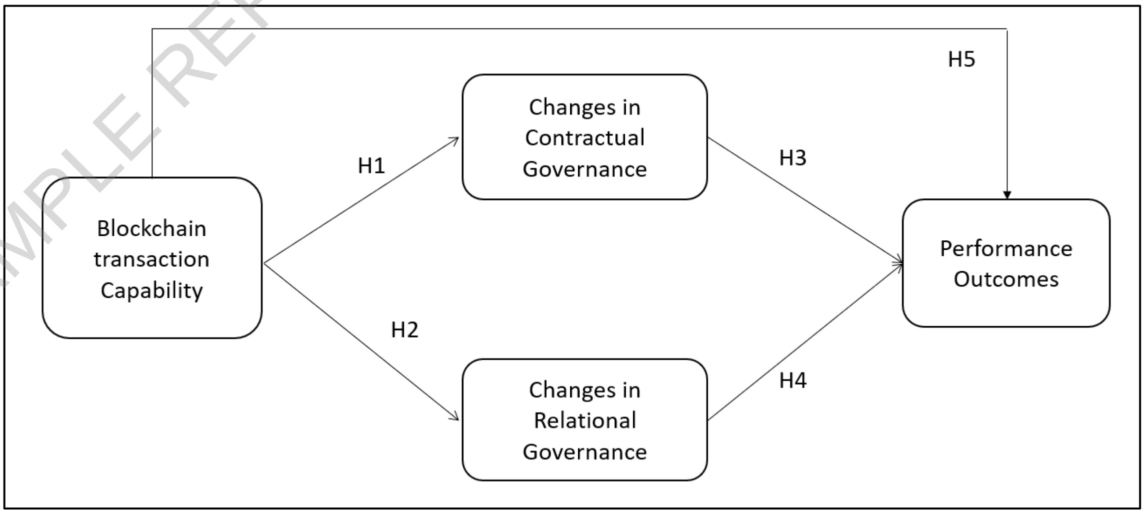
A summary of the indicators used to measure constructs' validity and reliability are detailed below (table below).

Indicator of convergent validity	**Definition**	**Rules of thumb**
Factor loadings (λ)	Correlation between the original variables and the factors, and the key to understanding the nature of a particular factor. Squared factor loadings indicate what percentage of the variance in an original variable is explained by a factor.	In the case of high convergent validity, high one-factor loadings would indicate that they converge on a common point, the latent construct. At a minimum, all factor loadings must be statistically significant. Because a significant load can still have quite weak strength, a good

		rule of thumb is that standardized loading estimates should be 0.5 or higher and ideally 0.7 or higher.
AVE	A summary measure of convergence among a set of items representing a latent construct. It is the average percentage of variation explained (variance extracted) among the items of a construct.	An AVE of 0.5 or higher is a good rule of thumb suggesting adequate convergence. An AVE of less than 0.5 indicates that, on average, more error remains in the items than variance explained by the latent factor structure imposed on the measure.
Indicator of internal consistency	**Definition**	**Rules of thumb**
Construct Reliability (CR)	Measure of reliability and internal consistency of the measured variables representing a latent construct. Must be established before construct validity can be assessed. It is computed from the squared sum of factor loadings for each construct and the sum of the error variance terms for a construct.	0.7 or higher suggests good reliability. Reliability between 0.6 and 0.7 may be acceptable, provided that other indicators of a model's construct validity are good.
Cronbach's Alpha	Cronbach's Alpha is a coefficient that represents the proportion of total variance among items that are due to the construct that they intend to measure	0.7 is the minimum acceptable level (Pallant, 2010).

<u>*Model 1*</u>

The constructs present in the model below were tested for reliability and validity.



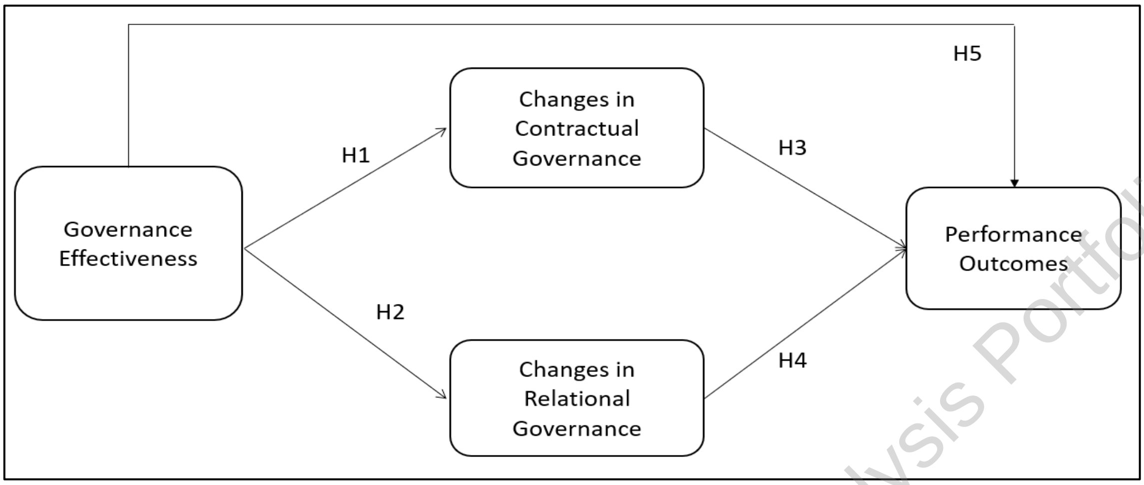
The occurrence of multicollinearity was assessed first through inflation factors and tolerance, which all remained under 10 and above 0.10 respectively, suggesting no multicollinearity is present. The factorability of the items was assessed using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Barlett's test of sphericity. KMO's test indicated a high-shared variance and a relatively low uniqueness invariance (0.965) and Barlett's test was validated ($\chi^2 = 5718.419$, df = 231, $p < 0.001$).

The measurement model was tested and indicated good-fit ($\chi^2/df = 2.354$, RMSEA = 0.061, CFI = 0.951, NFI = 0.918). Reliability and validity of constructs were considered appropriate. All Cronbach's Alpha were above 0.700, average variance extracted (AVE) were above 0.500 and composite reliabilities (CR) were above 0.700 (table below). All factor loadings (λ) were above 0.600, also suggesting appropriate convergent validity.

	Mean	SD	λ	Construct	α	AVE	CR
BTC1	3.931	1.032	0.829	Blockchain transaction Capability	0.924	0.604	0.924
BTC2	4.022	1.003	0.732				
BTC3	3.975	0.979	0.790				
BTC4	4.011	0.922	0.786				
BTC5	4.025	0.981	0.764				
BTC6	4.028	1.000	0.745				
BTC7	3.972	0.977	0.790				
BTC8	4.047	0.928	0.775				
CCG1	3.778	1.116	0.838	Changes in Contractual Governance	0.891	0.621	0.891
CCG2	4.003	0.938	0.797				
CCG3	3.956	0.956	0.737				
CCG4	3.997	0.987	0.770				
CCG5	3.911	1.013	0.794				
CRG1	3.745	1.134	0.831	Changes in Relational Governance	0.866	0.566	0.866
CRG2	3.997	0.990	0.781				
CRG3	3.997	0.938	0.750				
CRG4	4.064	0.974	0.771				
PER1	3.942	1.080	0.830	Performance Outcomes	0.867	0.614	0.864
PER2	4.094	0.886	0.747				
PER3	4.086	0.989	0.653				
PER4	4.105	0.894	0.771				
PER5	4.042	0.989	0.750				

Model 2

The figure below demonstrates the constructs tested in this section.



Multicollinearity among the items was absent (Tolerance > 0.100, VIF < 10). The data also demonstrated appropriate factorability since KMO's test (0.965) and Barlett's test (χ^2 = 6256.692, df = 276, $p < 0.001$) were validated.

The measurement model showed good fit (χ^2/df = 2.553, RMSEA = 0.066, CFI = 0.938, NFI = 0.902). The table below shows the indicators of validity.

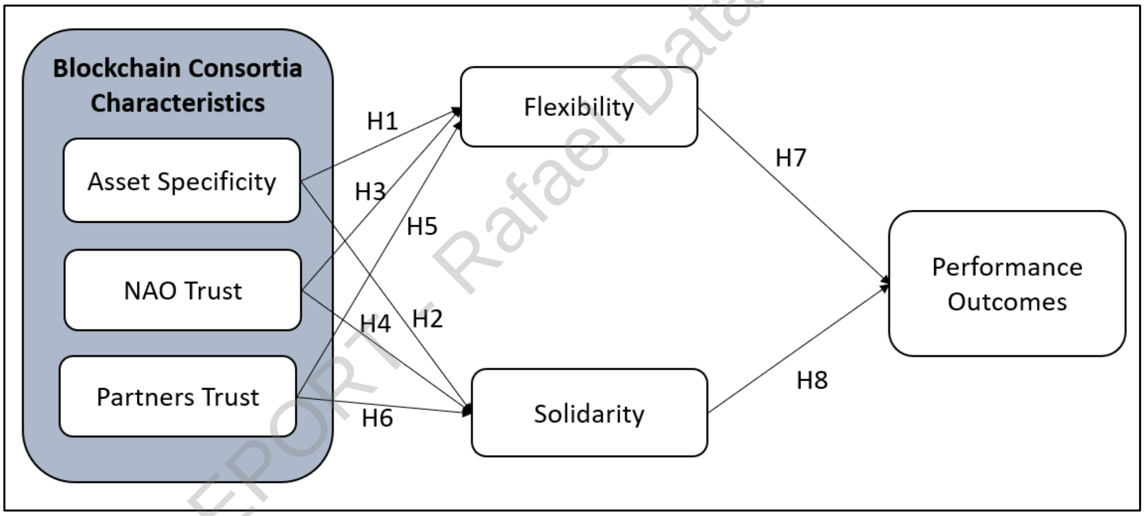
	Mean	SD	λ	Construct	α	AVE	CR
PGE1	3.939	1.089	0.791	Governance Effectiveness	0.926	0.555	0.926
PGE2	4.105	0.866	0.740				
PGE3	4.058	0.916	0.687				
PGE4	4.064	0.936	0.760				
PGE5	4.089	0.947	0.733				
PGE6	4.072	1.006	0.763				
PGE7	4.058	0.937	0.736				
PGE8	4.100	0.892	0.746				
PGE9	4.080	0.914	0.747				
PGE10	4.091	0.894	0.743				
CCG1	3.778	1.116	0.838	Changes in Contractual Governance	0.891	0.620	0.891
CCG2	4.003	0.938	0.798				
CCG3	3.956	0.956	0.739				
CCG4	3.997	0.987	0.762				
CCG5	3.911	1.013	0.797				
CRG1	3.745	1.134	0.834	Changes in Relational Governance	0.866	0.614	0.864
CRG2	3.997	0.990	0.775				
CRG3	3.997	0.938	0.751				

CRG4	4.064	0.974	0.772				
PER1	3.942	1.080	0.832	Performance Outcomes	0.867	0.565	0.866
PER2	4.094	0.886	0.752				
PER3	4.086	0.989	0.665				
PER4	4.105	0.894	0.748				
PER5	4.042	0.989	0.753				

Factor loadings were above 0.600 and average variance extracted of all constructs were above 0.500, suggesting sufficient validity. Reliability can be considered good as Cronbach's Alpha and Composite Reliability were above 0.800.

<u>*Model 3*</u>

The reliability and validity of the following constructs were tested and are presented in this section.



Multicollinearity among the items was not present (Tolerance > 0.100, VIF < 10). KMO's test (0.976) and Barlett's test (χ^2 = 8460.2, df = 435, p < 0.001) suggested good factorability of the data.

The covariance matrix of the model was not positive definite, suggesting problems with the data. A further exploration showed factor loadings higher than 1.000 for some items (TRP1, TRN1, SOL1), as well as very high correlations among constructs, specifically for the following pairs:

- Flexibility and Solidarity (r = 1.065);

- Flexibility and NAO trust (r = 1.031);
- Flexibility and Partner's Trust (r = 1.055);
- Partner's Trust and Solidarity (r = 1.039);
- Partner's Trust and NAO Trust (r = 1.023);
- NAO Trust and Partner's Trust (r = 1.003).

Very high correlations among constructs are problematic to the model. A second model was tested after deleting the factor loadings higher than 1, which did not solve the problem (non-positive covariance matrix). A third model was tested after deleting the Flexibility construct (the one with the highest number of correlations higher than 1) and the non-positive covariance matrix remained. A fourth model was successful, after dropping the Partner's trust construct, and has finally showed good-fit ($\chi^2/df = 2.454$, RMSEA = 0.064, CFI = 0.949, NFI = 0.917). The resulting validity and reliability indicators are shown below. All numbers indicated sufficient reliability, internal consistency and validity.

	Mean	SD	λ	Construct	α	AVE	CR
ASS1	3.806	1.114	0.805	Asset Specificity	0.906	0.581	0.907
ASS2	4.000	0.960	0.761				
ASS3	3.934	0.917	0.748				
ASS4	4.006	0.955	0.763				
ASS5	4.042	0.929	0.726				
ASS6	4.025	0.961	0.754				
ASS7	3.950	1.002	0.777				
TRN2	4.091	0.919	0.737	NAO Trust	0.848	0.527	0.848
TRN3	3.994	0.931	0.729				
TRN4	4.091	0.907	0.731				
TRN5	4.053	0.949	0.702				
TRN7	4.111	0.954	0.729				
SOL2	4.116	0.874	0.753	Solidarity	0.808	0.586	0.809
SOL3	4.066	0.898	0.778				
SOL4	4.144	0.923	0.765				
PER1	3.942	1.080	0.817	Performance Outcomes	0.867	0.567	0.867
PER2	4.094	0.886	0.745				
PER3	4.086	0.989	0.665				
PER4	4.105	0.894	0.765				
PER5	4.042	0.989	0.766				

References

Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Routledge.

DeVellis, R. F. (2012). *Scale development: Theory and Applications* (Third). SAGE Publications.

Hair, J. F., Black, W., Babin, B., & Anderson, R. (2014). *Multivariate data analysis* (Seventh). Pearson Education, Inc.

Li, C. H. (2016). Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. *Behavior Research Methods*, *48*(3), 936–949. https://doi.org/10.3758/s13428-015-0619-7

Pallant, J. (2010). *SPSS Survival Manual* (4th ed.). McGraw-Hill.