# Analysis Report

This report is structured as follows.

## Contents

## Data Screening

Before moving to the execution of the models, data was screened for multivariate and univariate outliers. A pragmatic approach to identify multivariate outliers is suggested by Hair et al. (2014): Mahalanobis distances. These are calculated for the variables to be entered on the multiple regression analysis and their results are divided by the number of variables. When sample sizes are large (100+), coefficients above 3.5 or 4.0 can be considered outliers (Hair et al., 2014). In this study, Mahalanobis distances were calculated for all the 43 survey items. Results were divided by 43 and 2 cases above 4.0 were removed.

After an initial check for scales' reliability using Cronbach's Alpha, which all came above 0.700, indicating good reliability, the scales were calculated by averaging the respective items of each one of the seven scales involved in the study: Blockchain-Enabled Supply Network; Competency Alignment; Behavioural Alignment; Process Alignment; Expectations Alignment; and Value Created. After that, the resulting total scores were screened again for outliers. The four scales related to Alignment were screened for multivariate outliers, since they are to be entered together as predictor variables of a multiple regression model. 17 cases were removed according following the Mahalanobis method. The Blockchain-Enabled Supply Network and the Value Created scales were screened for univariate outliers using standardized scores (Z-scores), following the guidelines of Hair et al. (2014). Since none of the calculated values were above 4, no cases were deleted. The total sample size of the study was reduced from 341 to 324 (N = 324).

## Reliability Tests

The first step before the analysis takes place was to execute reliability analysis. Reliability is an assessment of the degree of consistency between multiple measurements of a variable. One form of reliability is test–retest, by which consistency is measured between the responses for an individual at two points in time. The objective is to ensure that responses are not too varied across time periods so that a measurement taken at any point in time is reliable. A second and more commonly used measure of reliability is internal consistency, which applies to the consistency among the variables in a summated or

averaged scale. The rationale for internal consistency is that the individual items or indicators of the scale should all be measuring the same construct and thus be highly intercorrelated (Hair et al., 2014). The analysis in this study was done using Cronbach's Alpha. The table below shows the descriptive statistics of each survey item and the Alpha coefficients for the scales under study.

| Construct | Item | N | Mean | Std. Deviation | λ |
|---|---|---|---|---|---|
| Blockchain-Enabled Supply Network | BLOCK1 | 324 | 3.787 | 0.941 | 0.838 |
| | BLOCK2 | 324 | 3.775 | 0.932 | |
| | BLOCK3 | 324 | 3.923 | 0.885 | |
| | BLOCK4 | 324 | 3.923 | 0.892 | |
| Competency Alignment | CA1 | 324 | 4.120 | 0.791 | 0.804 |
| | CA2 | 324 | 4.160 | 0.790 | |
| | CA3 | 324 | 4.167 | 0.710 | |
| | CA4 | 324 | 4.204 | 0.678 | |
| Behavioural Alignment | BA1 | 324 | 4.167 | 0.785 | 0.807 |
| | BA2 | 324 | 4.216 | 0.727 | |
| | BA3 | 324 | 4.198 | 0.716 | |
| | BA4 | 324 | 4.216 | 0.748 | |
| Process Alignment | PA1 | 324 | 4.093 | 0.820 | 0.913 |
| | PA2 | 324 | 4.210 | 0.786 | |
| | PA3 | 324 | 4.164 | 0.780 | |
| | PA4 | 324 | 4.188 | 0.778 | |
| | PA5 | 324 | 4.194 | 0.772 | |
| | PA6 | 324 | 4.133 | 0.828 | |
| | PA7 | 324 | 4.241 | 0.745 | |
| | PA8 | 324 | 4.259 | 0.726 | |
| | PA9 | 324 | 4.241 | 0.724 | |
| | PA10 | 324 | 4.262 | 0.760 | |
| Expectations Alignment | EA1 | 324 | 4.133 | 0.797 | 0.820 |
| | EA2 | 324 | 4.275 | 0.714 | |
| | EA3 | 324 | 4.170 | 0.786 | |
| | EA4 | 324 | 4.222 | 0.699 | |
| | EA5 | 324 | 4.207 | 0.831 | |
| Value Created | OV1 | 324 | 4.173 | 0.784 | 0.941 |
| | OV2 | 324 | 4.191 | 0.810 | |
| | OV3 | 324 | 4.250 | 0.705 | |
| | OV4 | 324 | 4.262 | 0.727 | |
| | TV1 | 324 | 4.114 | 0.808 | |
| | TV2 | 324 | 4.241 | 0.706 | |

| | | | |
|---|---|---|---|
| TV3 | 324 | 4.170 | 0.750 |
| TV4 | 324 | 4.284 | 0.686 |
| SV1 | 324 | 4.102 | 0.813 |
| SV2 | 324 | 4.235 | 0.791 |
| SV3 | 324 | 4.160 | 0.774 |
| SV4 | 324 | 4.256 | 0.750 |
| RV1 | 324 | 4.151 | 0.847 |
| RV2 | 324 | 4.265 | 0.765 |
| RV3 | 324 | 4.315 | 0.681 |
| RV4 | 324 | 4.302 | 0.713 |

All of the tested scales reached a minimum Alpha of 0.700, which can be considered good reliability. The item scores were averaged to form the overall scale scores.

**Descriptive Statistics**

This section presents the descriptive statistics of the scales under study (Table below). Along with the minimum and maximum values, the mean and the standard deviation, values of skewness and kurtosis are also present. These are values that indicate the distribution of the data on each specific variable. It can also be interpreted as a measure of to what extent data is normally distributed. Values above +1.500 or below -1.500 would indicate lack of normality. In this study, the scales were slightly non-normal (kurtotic). However, this does not represent any limitation to the regression analysis, which assume that residuals are non-normal but not the scores of the variables themselves.

| | N | Minimum | Maximum | Mean | Std. Deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| Blockchain-enabled Supply Network | 324 | 1.500 | 5.000 | 3.852 | 0.749 | -0.573 | 0.000 |
| Competency Alignment | 324 | 1.750 | 5.000 | 4.163 | 0.590 | -0.893 | 1.670 |
| Behavioural Alignment | 324 | 1.750 | 5.000 | 4.199 | 0.593 | -1.095 | 2.228 |
| Process Alignment | 324 | 1.400 | 5.000 | 4.198 | 0.579 | -1.250 | 2.873 |
| Expectations Alignment | 324 | 1.600 | 5.000 | 4.201 | 0.585 | -1.187 | 2.823 |
| Value Created | 324 | 1.563 | 5.000 | 4.217 | 0.552 | -1.175 | 2.600 |

| | |
|---|---|
| Valid N (listwise) | 324 |

**Correlation Analysis**

Correlation coefficients are indicators of associations between variables (Pallant, 2010). Values between 0.10 and 0.29 indicate a small degree of association, while values between 0.30 and 0.49 are considered medium and values higher than 0.50 represent a high degree of association (Cohen, 1988). This test was used to measure the association between the four scales under study.

There are several different statistics available, depending on the level of measurement and the nature of your data. Pearson' coefficient 'r' is designed for interval level (continuous) variables, whereas Spearman's 'rho' is designed for use with ordinal level or ranked data and is particularly useful when the data does not meet the criteria for Pearson correlation (Pallant, 2010). As the variables under study are measured in a continuous level, Pearson's test was used. The table below shows the correlation matrix.

| | Blockchain-enabled Supply Network | Competency Alignment | Behavioural Alignment | Process Alignment | Expectations Alignment | Value Created |
|---|---|---|---|---|---|---|
| Blockchain-enabled Supply Network | 1 | 0.655** | 0.614** | 0.638** | 0.606** | 0.612** |
| Competency Alignment | 0.655** | 1 | 0.851** | 0.868** | 0.808** | 0.822** |
| Behavioural Alignment | 0.614** | 0.851** | 1 | 0.898** | 0.853** | 0.848** |
| Process Alignment | 0.638** | 0.868** | 0.898** | 1 | 0.883** | 0.875** |
| Expectations Alignment | 0.606** | 0.808** | 0.853** | 0.883** | 1 | 0.866** |
| Value Created | 0.612** | 0.822** | 0.848** | 0.875** | 0.866** | 1 |

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

All pairs of variables are strongly and positively correlated (r > 0.500). This means that when the value of one scale increases, the value for the other scales are expected to increase as well.

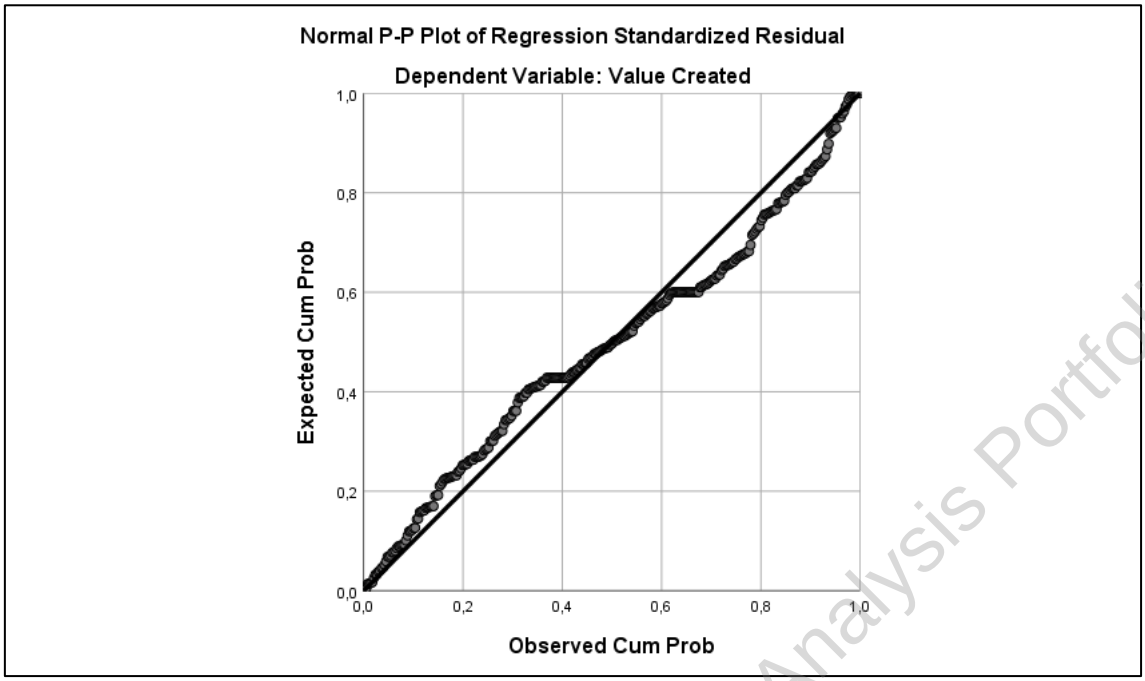
**Regression Analysis**

Five regression models were executed. One multiple regression to test the predictors of 'Value Created' and four simple linear regressions to test the effects of Blockchain-enabled supply network on the four types of Alignment. The multiple regression model was significant and explained 82% of the variance ($F = 357.094$, $p < .001$, $R^2 = 0.815$). The coefficients of the model are shown below, along with collinearity statistics. No collinearity was present, since all VIF scores were below 10 (Hair et al., 2014).

| Dependent Variable: Value Created | β | t | p | Collinearity Statistics | |
|---|---|---|---|---|---|
| | | | | Tolerance | VIF |
| (Constant) | | 4.522 | 0.000 | | |
| Competency Alignment | 0.151 | 2.940 | 0.004 | 0.218 | 4.581 |
| Behavioural Alignment | 0.156 | 2.623 | 0.009 | 0.162 | 6.178 |
| Process Alignment | 0.288 | 4.246 | 0.000 | 0.124 | 8.062 |
| Expectations Alignment | 0.357 | 6.662 | 0.000 | 0.199 | 5.016 |

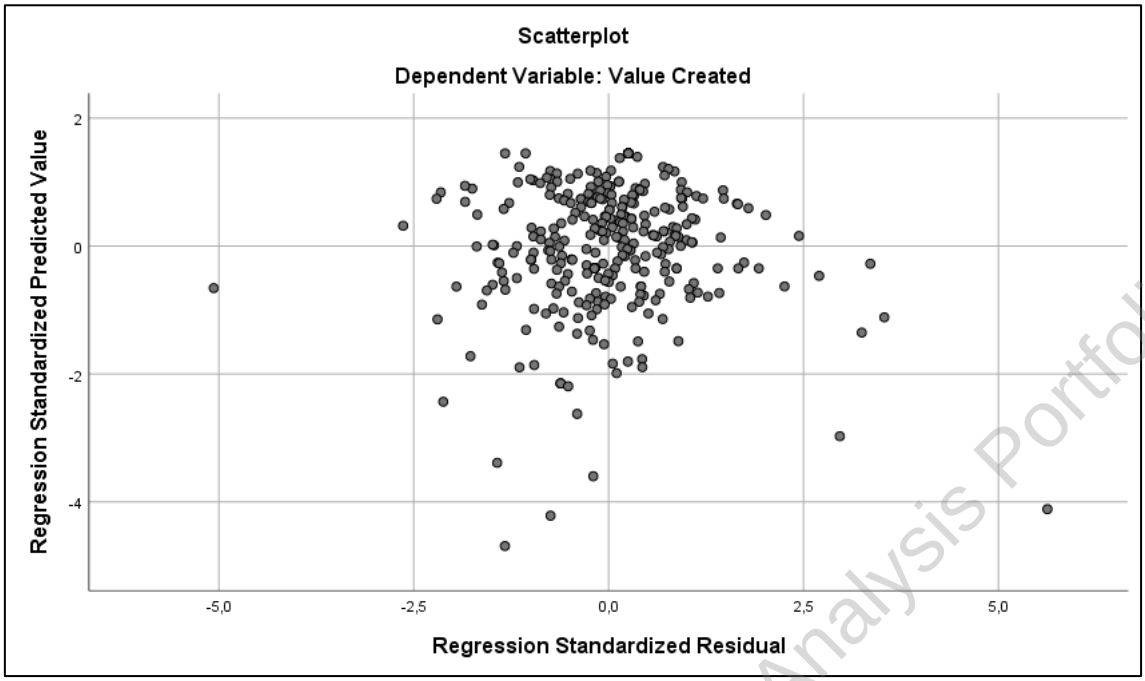
All of the four variables were significant predictors of Value Created ($p < .01$). The predictor with the strongest effect was Expectations Alignment ($\beta = 0.357$, $p < .001$).

Lastly, violations of the assumptions of normality, linearity and homoscedasticity of residuals (errors) were examined for the regression model. The next figure shows a P-P plot, which is used to assess the normality of residuals. The observations should follow a diagonal pattern to suggest normality of residuals (Tabachnick and Fidell, 2014).




The graph suggests that no substantial violations of normality are present.

The next figure shows a scatterplot of standardized residuals and standardized predicted values of the dependent variable. If points are well distributed along the X and Y axes, this would suggest homoscedasticity and linearity. Nonlinearity is indicated when most of the residuals are above the zero line on the plot at some predicted values and below the zero line at other predicted values. Lack of homoscedasticity is indicated if values are more dispersed for a given predicted values than at other values (Tabachnick and Fidell, 2014).

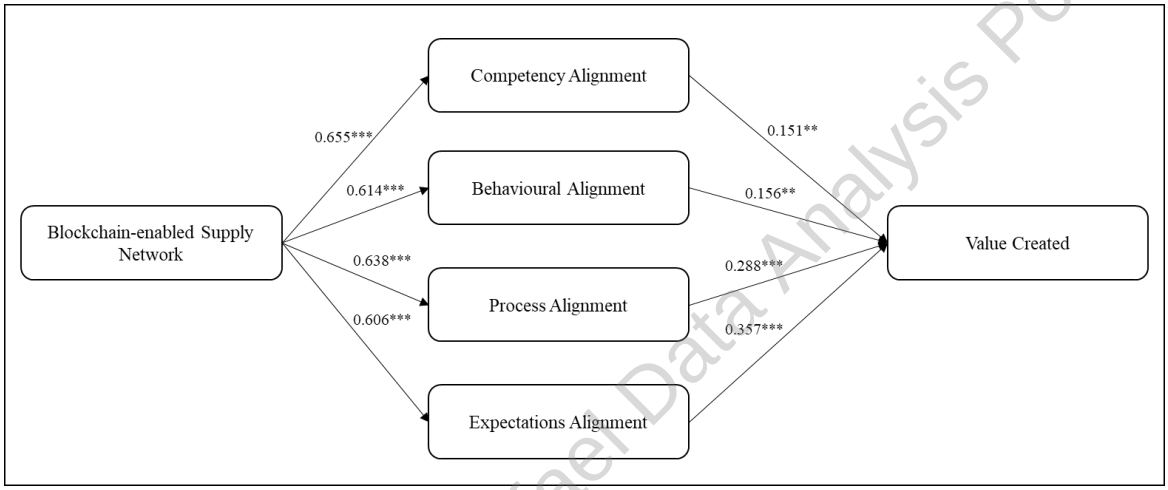



The graph suggests that residuals are linear and homoscedastic.

The table below show the coefficients of the other four models that are testing the effect of Blockchain-enabled Supply Network on the four types of Alignment. In all models, Blockchain-enabled Supply Network was a significant predictor of the Alignment constructs ($p < .001$).

| Dependent Variable: Competency Alignment | β | t | p | F | $R^2$ |
|---|---|---|---|---|---|
| (Constant) | | 16.675 | 0.000 | 241.864 | 0.427 |
| Blockchain-Enabled Supply Network | 0.655 | 15.552 | 0.000 | | |
| Dependent Variable: Behavioural Alignment | β | t | p | F | $R^2$ |
| (Constant) | | 17.034 | 0.000 | 194.993 | 0.375 |
| Blockchain-Enabled Supply Network | 0.614 | 13.964 | 0.000 | | |
| Dependent Variable: Process Alignment | β | t | p | F | $R^2$ |
| (Constant) | | 17.629 | 0.000 | 220.712 | 0.405 |
| Blockchain-Enabled Supply Network | 0.638 | 14.856 | 0.000 | | |
| Dependent Variable: Expectations Alignment | β | t | p | F | $R^2$ |
| (Constant) | | 17.489 | 0.000 | 186.400 | 0.365 |
| Blockchain-Enabled Supply Network | 0.606 | 13.653 | 0.000 | | |

An analysis of indirect effects showed that Blockchain-enabled Supply Network does not have any direct effect on Value Created, but rather mediated by the Alignment constructs. Direct effect is non-existent (d = .024, p = .308), but there are weak indirect effects mediated by Competency Alignment (d = .067), Behavioural Alignment (d = .070), Process Alignment (d = .133) and Expectations Alignment (d = .158), generating a moderate total effect of Blockchain-enabled Supply Network on Value Created (d = .451. p < .001). The figure below shows the tested structural model.




***: p < .001
**: p < .01
*: p < .05

## References

Cohen, J., 1988. Statistical power analysis for the behavioral sciences, 2nd ed. Erlbaum, Hillsdale, NJ.

Hair, J.F., Black, W., Babin, B., Anderson, R., 2014. Multivariate data analysis, Seventh. ed. Pearson Education, Inc., Edinburgh.

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Tabachnick, B.G., Fidell, L.S., 2014. Using multivariate statistics / Barbara G. Tabachnick, Linda S. Fidell.