Statistics MSc Thesis BA Information Systems

Roman Abegglen

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Disclaimer

Please note that the execution of this markdown file only will work with the relative directory which it is located in. For the study, only the models with all the indicators, derived from the script "plsPathAll-Vars.R" and "plsPath4.R". Furthermore, the scripts called "cronbachsAlpha.R" and "manipulationCheck.R" are further relevant for the study and this document. For additional info on the cross-loadings, please refer to "CrossLoadingsTable.csv".

1. Data Management

With the data management pipeline, all data exported from Qualtrics are aggregated. As in the raw data the different entries are separated colwise by treatment, this get's changed, so all dimensions are rowwise grouped by the treatments (AE/NE/AN/NN).

In a further step, the data will get prepared, so the respective constructs can be used along with the intended Likert Scales, derived from the respective text based answers from the raw data. There is a feature in Qualtrics doing something similar, however this would violate the principle that the raw data is untouched upon extraction.

2. Calculating the first Model

2.1 Unidimensionality

First, all variables will be included within the first model. The model will get adjusted based on the indicator loadings below 0.7. Also unidimensionality will get checked along the way.

After model calculation, the unidimensionality measures of the first model can be seen.

```
anthroModelAll$unidim
```

```
##                    Mode MVs   C.alpha    DG.rho eig.1st   eig.2nd
## anthroTreat          A   1 1.0000000 1.0000000 1.000000 0.0000000
## empathTreat          A   1 1.0000000 1.0000000 1.000000 0.0000000
## treatAnthroEmpath    A   1 1.0000000 1.0000000 1.000000 0.0000000
## treatAnthroInter     A   2 0.6245949 0.8419617 1.454117 0.5458829
## treatEmpathInter     A   2 0.7229694 0.8783369 1.566133 0.4338668
## anthro               A   3 0.7289545 0.8472134 1.948141 0.6108122
## empathy              A   3 0.7851694 0.8748328 2.099427 0.5088888
## AnthroEmpath         A   3 0.9309585 0.9560221 2.636226 0.2140147
## interEmpath          A   3 0.8970744 0.9358236 2.488171 0.2930240
```

```
## interAnthro              A    2 0.7568325 0.8915964 1.608794 0.3912064
## servFailure              A    3 0.4847009 0.7442353 1.479608 0.8133004
## InitialTechTrustExpect   A    9 0.8300962 0.8717305 4.153706 1.3993316
## PostIncTechTrustExpect   A    9 0.8970263 0.9173286 5.031560 1.6242207
## PostIncTechTrustPerfor   A    9 0.8628800 0.8930246 4.434634 1.3991378
## PostIncTechTrustDiconf   A    9 0.9091067 0.9259307 5.254092 1.1034065
## PostIncTechTrustSatisf   A    4 0.8456133 0.8965001 2.737850 0.5092808
## PostIncTechTrustIntent   A    3 0.8990474 0.9369464 2.496074 0.2648262
## playfulness              A    7 0.8285742 0.8733934 3.531485 1.2418835
## innovativeness           A    4 0.8221126 0.8829218 2.617652 0.6184914
## robotSE                  A    9 0.7705992 0.8312607 3.230174 1.0890852
## trustingstance           A    3 0.6209812 0.8003982 1.790960 0.9256279
## genderNum                A    1 1.0000000 1.0000000 1.000000 0.0000000
## eduNum                   A    1 1.0000000 1.0000000 1.000000 0.0000000
## IntentOfUsageContinuat   A    3 0.8517742 0.9101502 2.314719 0.3959653
## reUse                    A    1 1.0000000 1.0000000 1.000000 0.0000000
```

Within this table, Cronbach's Alpha, Dillon-Goldstein's Rho, 1st and 2nd Eigenvalue are visible. There are also interaction terms within the model to check for moderation effects.
treatAnthroInter = Moderation of treatment imposed anthropomorphism on the negative perceived effects of the failing robo-advisor
treatEmpathInter = Moderation of treatment imposed empathy on the negative perceived effects of the failing robo-advisor
interAnthro = Moderation of the perceived anthropomorphism on the negative perceived effects of the failing robo-advisor
interEmpath = Moderation of the perceived empathy on the negative perceived effects of the failing robo-advisor

Overall it is visible that only the perceived service failure might be a little unreliable. This construct was reduced to one item, which was asking the participant whether she/he thinks that the robo-advisor failed doing its task. This Question was believed to be the most concise.

2.2 Loadings/Outer model

Inspecting the outer model is important to decide to cull indicators of latent variables which capture not enough variance (< 0.7). This can be illustrated by a table, however as this model is quite complex, a table would be confusing. Better are plots showing which indicators are below 0.7, demonstrated on the next page. The indicators below 0.7 were omitted for the final model used for this study. Compare Figure 1.

2.3 Cross-loadings

The same counts for cross-loadings and this rather complex model. A table is rather ill-fit as it would not fit on a page. A heat map might give more insights about the variables. It is visible that in case of a lot of variables, the loadings might be low overall or even higher, compared to other latent variable blocks which the indicator is not supposed to predict. Traitor indicators will be an additional subject of the item culling process. Compare Figure 2.
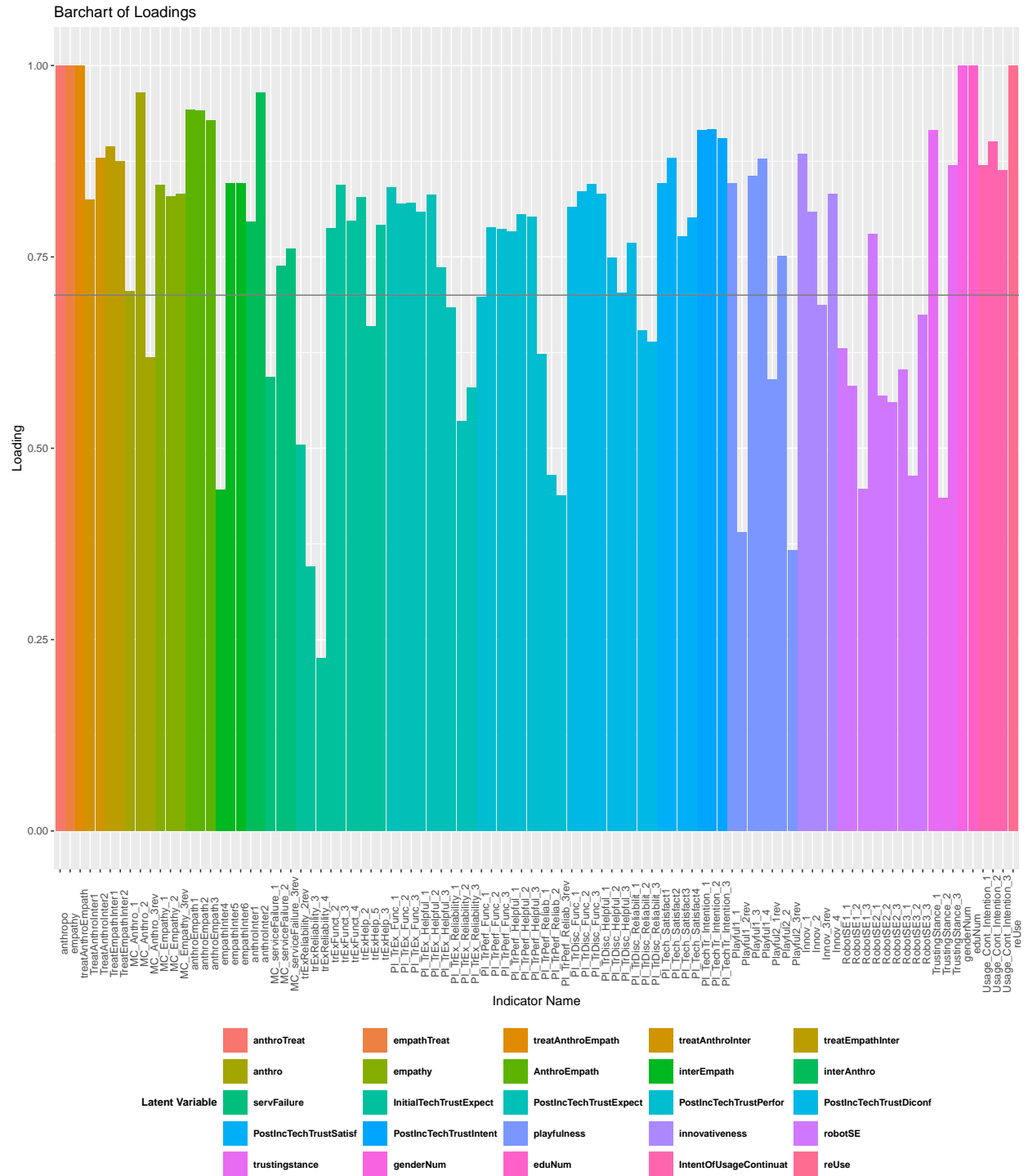
Figure 1: Barchart of indicator loadings grouped by latent variable. The horizontal line indicates the 0.7 threshold.
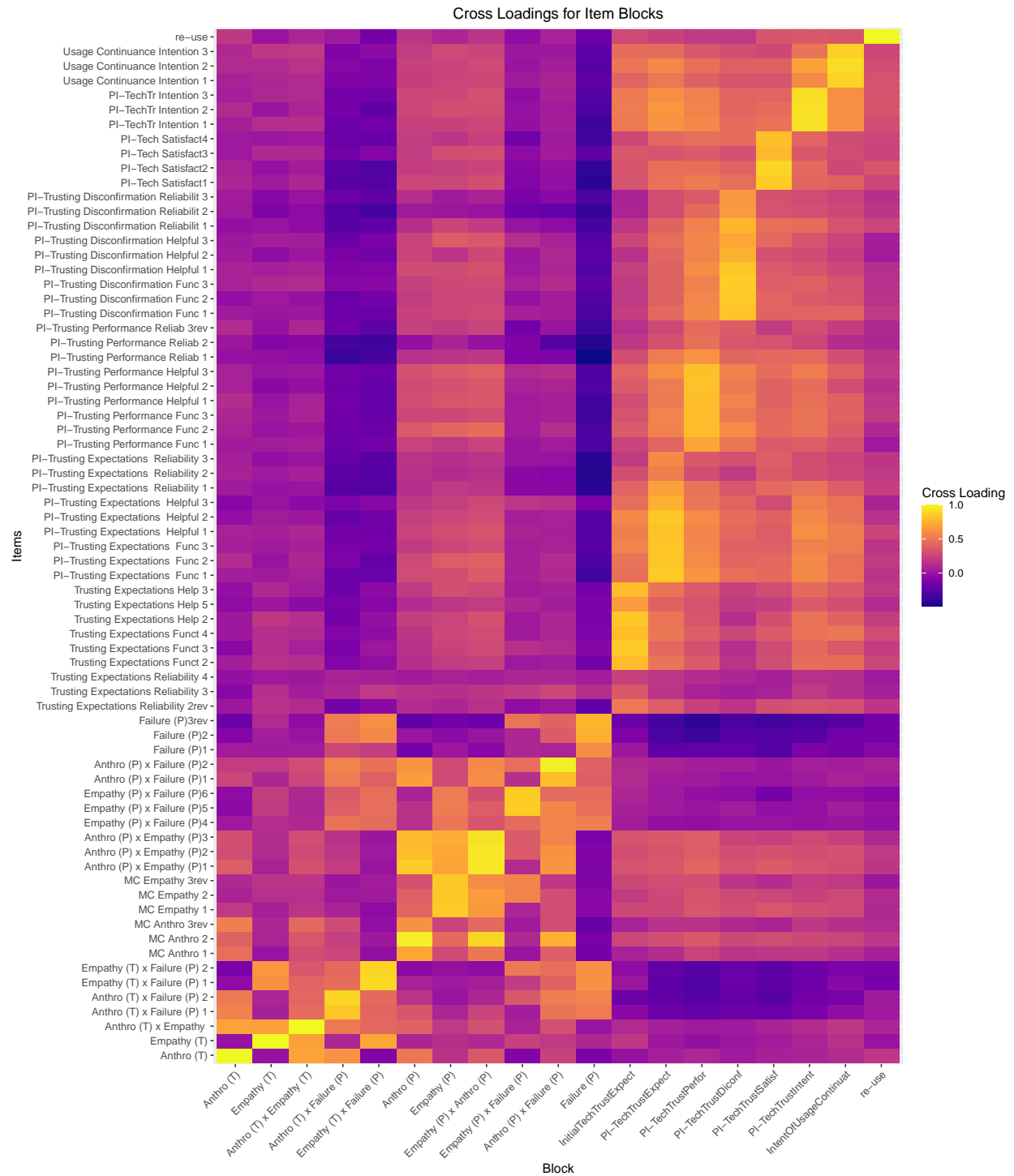
Figure 2: Heatmap of the crossloadings within the respective latent variables. Brighter values indicate higher loadings

2.4 The inner Model

Next is the inspection of the inner model, where it is visible whether and which indicators will predict a latent variable within the PLS path model. Estimates with the respective t-values and related p-values are indicated within each block. Each block represents one latent variable and the latent variables are ordered in a way that they represent the path model.

```
anthroModelAll$inner_model
```

```
## $InitialTechTrustExpect
##                       Estimate Std. Error       t value     Pr(>|t|)
## Intercept         5.583636e-17 0.06362629  8.775674e-16 1.000000000
## anthroTreat      -5.510223e-02 0.21065165 -2.615799e-01 0.793905457
## empathTreat       1.822594e-01 0.20547684  8.870072e-01 0.376104439
## treatAnthroEmpath -5.865319e-02 0.28143031 -2.084110e-01 0.835112953
## anthro           -2.241999e-01 0.17286005 -1.297002e+00 0.196074152
## empathy          -5.627453e-02 0.12716389 -4.425355e-01 0.658563821
## AnthroEmpath      5.933720e-01 0.22266162  2.664905e+00 0.008308161
##
## $PostIncTechTrustExpect
##                        Estimate Std. Error       t value     Pr(>|t|)
## Intercept          3.296628e-17 0.04908531  6.716119e-16 1.000000e+00
## treatAnthroInter  -1.690072e-02 0.07301161 -2.314800e-01 8.171706e-01
## treatEmpathInter  -1.172049e-01 0.07238495 -1.619188e+00 1.069293e-01
## interEmpath        1.109953e-01 0.05574545  1.991110e+00 4.778382e-02
## interAnthro        1.840776e-01 0.06756792  2.724334e+00 6.994051e-03
## servFailure       -3.530042e-01 0.07777620 -4.538718e+00 9.590788e-06
## InitialTechTrustExpect 5.123009e-01 0.05180306  9.889395e+00 3.920470e-19
##
## $PostIncTechTrustPerfor
##                        Estimate Std. Error     t value     Pr(>|t|)
## Intercept          7.305416e-18 0.04960603 1.472687e-16 1.000000e+00
## PostIncTechTrustExpect 6.916062e-01 0.04960603 1.394198e+01 8.732314e-32
##
## $PostIncTechTrustDiconf
##                        Estimate Std. Error     t value     Pr(>|t|)
## Intercept          1.753077e-16 0.04928262 3.557190e-15 1.000000e+00
## PostIncTechTrustExpect 5.950733e-02 0.06823252 8.721257e-01 3.841311e-01
## PostIncTechTrustPerfor 6.557523e-01 0.06823252 9.610554e+00 2.279069e-18
##
## $PostIncTechTrustSatisf
##                        Estimate Std. Error     t value     Pr(>|t|)
## Intercept          6.867189e-17 0.05517087 1.244713e-15 1.000000000
## PostIncTechTrustExpect 2.504263e-01 0.07652243 3.272587e+00 0.001245947
## PostIncTechTrustPerfor 2.337860e-01 0.09158984 2.552531e+00 0.011404537
## PostIncTechTrustDiconf 2.059513e-01 0.07706812 2.672328e+00 0.008123954
##
## $PostIncTechTrustIntent
##                        Estimate Std. Error     t value     Pr(>|t|)
## Intercept          3.557746e-17 0.05309283 6.700992e-16 1.000000e+00
## PostIncTechTrustPerfor 4.737742e-01 0.07835955 6.046157e+00 6.692863e-09
## PostIncTechTrustDiconf 2.490697e-02 0.07540421 3.303127e-01 7.414930e-01
## PostIncTechTrustSatisf 2.178680e-01 0.06477616 3.363398e+00 9.149709e-04
##
```

```
## $IntentOfUsageContinuat
##                           Estimate Std. Error       t value      Pr(>|t|)
## Intercept             -1.746846e-16 0.04918749 -3.551404e-15 1.000000e+00
## PostIncTechTrustSatisf  5.421846e-02 0.05695831  9.518973e-01 3.422700e-01
## PostIncTechTrustIntent  5.165155e-01 0.06325274  8.165900e+00 3.220151e-14
## playfulness            5.002933e-02 0.06527307  7.664620e-01 4.442832e-01
## innovativeness         5.594325e-02 0.06896772  8.111511e-01 4.182196e-01
## robotSE                2.222145e-01 0.06202995  3.582375e+00 4.253169e-04
## trustingstance        -8.415327e-03 0.05462932 -1.540441e-01 8.777265e-01
## genderNum              6.247634e-02 0.05252918  1.189364e+00 2.356721e-01
## eduNum                -3.312503e-02 0.05076510 -6.525158e-01 5.147995e-01
##
## $reUse
##                           Estimate Std. Error       t value      Pr(>|t|)
## Intercept              1.358550e-17 0.06109709  2.223592e-16 1.0000000000
## playfulness            6.070896e-02 0.08110722  7.485026e-01 0.4550108163
## innovativeness         1.165679e-01 0.08575634  1.359292e+00 0.1755402908
## robotSE                4.564492e-02 0.07787954  5.860964e-01 0.5584523757
## trustingstance         3.124736e-02 0.06756545  4.624754e-01 0.6442285221
## genderNum             -1.539406e-01 0.06491290 -2.371495e+00 0.0186379811
## eduNum                 2.118099e-01 0.06273460  3.376286e+00 0.0008781597
## IntentOfUsageContinuat 2.511485e-01 0.07235715  3.470956e+00 0.0006317016
```

2.5 Direct relationships

It is also possible to list all direct relationships within the model itself

```
##                                                     direct      indirect
## anthroTreat -> InitialTechTrustExpect             -0.055102231  0.000000000
## empathTreat -> InitialTechTrustExpect              0.182259431  0.000000000
## treatAnthroEmpath -> InitialTechTrustExpect       -0.058653185  0.000000000
## treatAnthroInter -> PostIncTechTrustExpect        -0.016900725  0.000000000
## treatEmpathInter -> PostIncTechTrustExpect        -0.117204865  0.000000000
## anthro -> InitialTechTrustExpect                  -0.224199894  0.000000000
## empathy -> InitialTechTrustExpect                 -0.056274532  0.000000000
## AnthroEmpath -> InitialTechTrustExpect             0.593372042  0.000000000
## interEmpath -> PostIncTechTrustExpect              0.110995311  0.000000000
## interAnthro -> PostIncTechTrustExpect              0.184077605  0.000000000
## servFailure -> PostIncTechTrustExpect             -0.353004229  0.000000000
## InitialTechTrustExpect -> PostIncTechTrustExpect   0.512300902  0.000000000
## PostIncTechTrustExpect -> PostIncTechTrustPerfor   0.691606247  0.000000000
## PostIncTechTrustExpect -> PostIncTechTrustDiconf   0.059507335  0.453522400
## PostIncTechTrustExpect -> PostIncTechTrustSatisf   0.250426324  0.267346977
## PostIncTechTrustPerfor -> PostIncTechTrustDiconf   0.655752318  0.000000000
## PostIncTechTrustPerfor -> PostIncTechTrustSatisf   0.233785950  0.135053059
## PostIncTechTrustPerfor -> PostIncTechTrustIntent   0.473774175  0.096691017
## PostIncTechTrustDiconf -> PostIncTechTrustSatisf   0.205951325  0.000000000
## PostIncTechTrustDiconf -> PostIncTechTrustIntent   0.024906966  0.044870203
## PostIncTechTrustSatisf -> PostIncTechTrustIntent   0.217867998  0.000000000
## PostIncTechTrustSatisf -> IntentOfUsageContinuat   0.054218460  0.112532199
## PostIncTechTrustIntent -> IntentOfUsageContinuat   0.516515504  0.000000000
## playfulness -> IntentOfUsageContinuat             0.050029329  0.000000000
## playfulness -> reUse                               0.060708965  0.012564790
## innovativeness -> IntentOfUsageContinuat           0.055943246  0.000000000
## innovativeness -> reUse                            0.116567888  0.014050062
## robotSE -> IntentOfUsageContinuat                  0.222214525  0.000000000
## robotSE -> reUse                                   0.045644918  0.055808842
## trustingstance -> IntentOfUsageContinuat          -0.008415327  0.000000000
## trustingstance -> reUse                            0.031247359 -0.002113497
## genderNum -> IntentOfUsageContinuat                0.062476337  0.000000000
## genderNum -> reUse                                -0.153940625  0.015690838
## eduNum -> IntentOfUsageContinuat                  -0.033125029  0.000000000
## eduNum -> reUse                                    0.211809930 -0.008319301
## IntentOfUsageContinuat -> reUse                    0.251148487  0.000000000
```

2.6 Pseudo-goodness of fit of the model

The plspm package has a goodness of fit measure, which is the geometric mean of the respective average R-squares and average communalities. That way a measure for a goodness of fit gets calculated.

```
anthroModelAll$gof
```

```
## [1] 0.4739823
```

3. Calculating the final model

3.1 Indicator loadings after the item culling process

After the loadings were showing that a lot of variables were not sufficiently capturing variance, they got omitted to reduce model complexity and with that also goodness of fit. With the variables with insufficient laodings removed, we see the following picture in figure 3. Note that of course a lot of variables became univariate, which means they have a loading of 1.
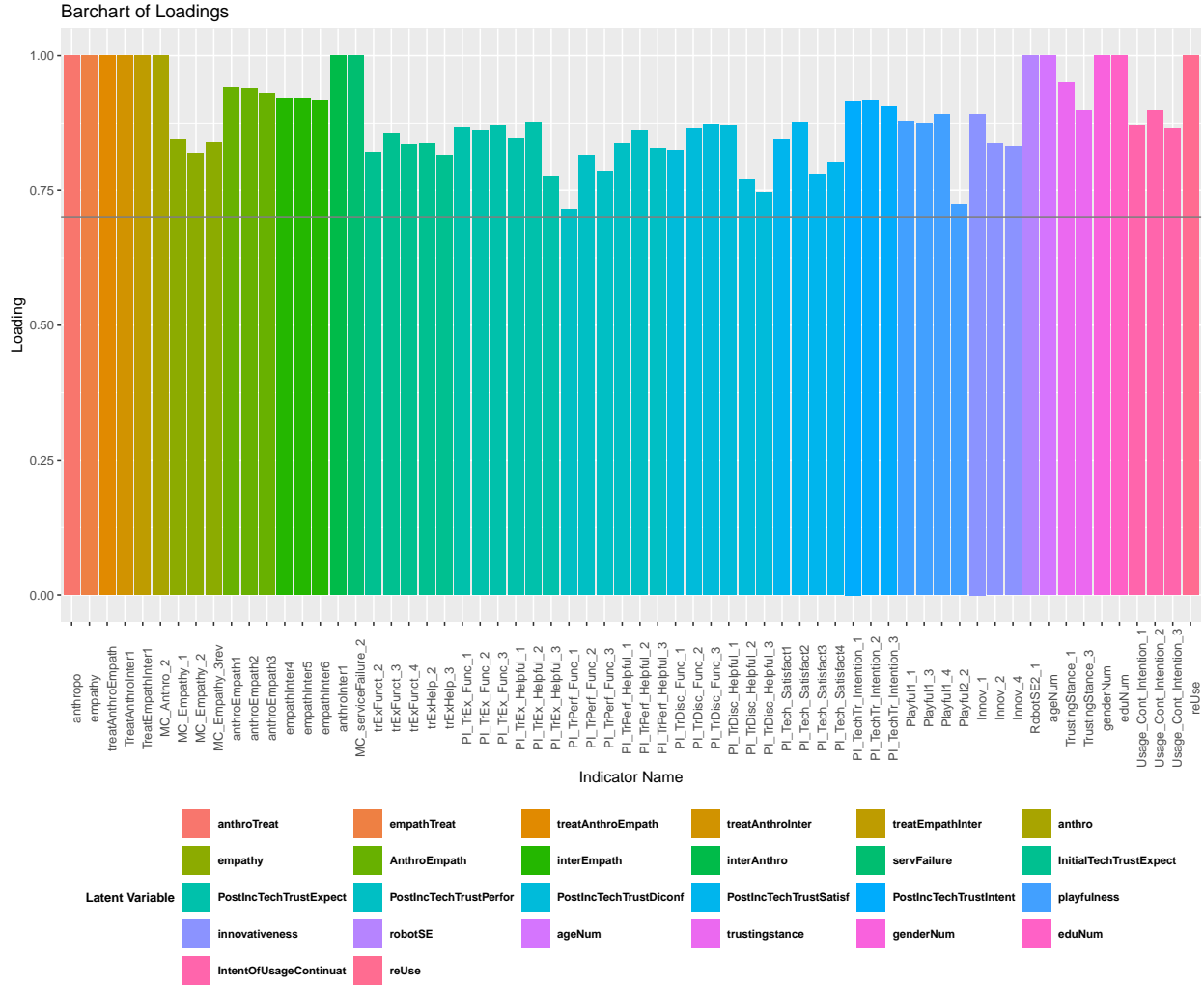

Figure 3: Barchart of indicator loadings grouped by latent variable. The horizontal line indicates the 0.7 threshold.

3.2 Cross-loadings of the new model

Here it clearly visible that especially within the interactions, there is the danger of a traitor variable, however the values never became higher than in the respective latent variable block, the indicators were assigned to. Here it s also visible that all the traitor indicators disappeared after the item culling process. If read like a correlation matrix, the pattern should reflect the latent variable blocks of the model.

Figure 4: Heatmap of the crossloadings within the respective latent variables. Brighter values indicate higher loadings

3.3 Inner model of the final model

The final model's inner model reflect the values within figure 8. of the MSc-thesis.

```
anthroModel4$inner_model
```

```
## $InitialTechTrustExpect
##                           Estimate Std. Error       t value   Pr(>|t|)
## Intercept            -7.381233e-17 0.06418587 -1.149978e-15 1.00000000
## anthroTreat          -1.190862e-01 0.20778961 -5.731097e-01 0.56719243
## empathTreat           1.190485e-01 0.20660475  5.762136e-01 0.56509677
## treatAnthroEmpath     1.631358e-02 0.28311388  5.762198e-02 0.95410532
## anthro               -1.566396e-01 0.19480055 -8.041026e-01 0.42226021
## empathy              -9.027037e-03 0.14339350 -6.295290e-02 0.94986475
## AnthroEmpath          5.002434e-01 0.26622160  1.879049e+00 0.06164313
##
## $PostIncTechTrustExpect
##                             Estimate Std. Error       t value     Pr(>|t|)
## Intercept               8.455269e-18 0.05287730  1.599036e-16 1.000000e+00
## treatAnthroInter       -8.021718e-02 0.09139005 -8.777452e-01 3.810996e-01
## treatEmpathInter       -1.128518e-01 0.08454534 -1.334808e+00 1.834053e-01
## interEmpath             1.879110e-01 0.09559875  1.965622e+00 5.067951e-02
## interAnthro             2.026258e-01 0.08971881  2.258454e+00 2.496004e-02
## servFailure            -3.078135e-01 0.11268409 -2.731650e+00 6.846014e-03
## InitialTechTrustExpect  5.124325e-01 0.05630505  9.101004e+00 7.616014e-17
##
## $PostIncTechTrustPerfor
##                             Estimate Std. Error       t value     Pr(>|t|)
## Intercept               3.875346e-17  0.0504539 7.680964e-16 1.000000e+00
## PostIncTechTrustExpect  6.784789e-01  0.0504539 1.344750e+01 3.233481e-30
##
## $PostIncTechTrustDiconf
##                             Estimate Std. Error       t value     Pr(>|t|)
## Intercept               2.682409e-16 0.05040631 5.321574e-15 1.000000e+00
## PostIncTechTrustExpect  8.002569e-02 0.06861550 1.166292e+00 2.448131e-01
## PostIncTechTrustPerfor  6.242585e-01 0.06861550 9.097923e+00 7.014006e-17
##
## $PostIncTechTrustSatisf
##                             Estimate Std. Error       t value   Pr(>|t|)
## Intercept               5.144232e-17 0.05756398 8.936546e-16 1.000000000
## PostIncTechTrustExpect  1.845538e-01 0.07861103 2.347683e+00 0.019820717
## PostIncTechTrustPerfor  2.494211e-01 0.09245965 2.697621e+00 0.007551175
## PostIncTechTrustDiconf  2.005783e-01 0.07861849 2.551286e+00 0.011444111
##
## $PostIncTechTrustIntent
##                             Estimate Std. Error       t value     Pr(>|t|)
## Intercept               9.469406e-17 0.05419614 1.747247e-15 1.000000e+00
## PostIncTechTrustPerfor  4.311661e-01 0.07739829 5.570745e+00 7.717653e-08
## PostIncTechTrustDiconf  1.235477e-02 0.07506290 1.645922e-01 8.694233e-01
## PostIncTechTrustSatisf  2.649274e-01 0.06413310 4.130900e+00 5.216745e-05
##
## $IntentOfUsageContinuat
##                             Estimate Std. Error       t value     Pr(>|t|)
## Intercept              -1.130403e-16 0.04896125 -2.308771e-15 1.000000e+00
```

```
## PostIncTechTrustSatisf   4.153836e-02 0.05764239  7.206218e-01 4.719672e-01
## PostIncTechTrustIntent    5.468641e-01 0.06056883  9.028804e+00 1.321638e-16
## playfulness               3.047529e-02 0.06522600  4.672261e-01 6.408368e-01
## innovativeness            1.098033e-01 0.06689428  1.641446e+00 1.022457e-01
## robotSE                   2.102347e-01 0.05533992  3.798970e+00 1.917148e-04
## ageNum                    7.798083e-03 0.05033535  1.549226e-01 8.770355e-01
## trustingstance           -9.816300e-04 0.05317277 -1.846114e-02 9.852890e-01
## genderNum                 7.767636e-02 0.05211764  1.490405e+00 1.376624e-01
## eduNum                   -2.856636e-02 0.05046418 -5.660720e-01 5.719670e-01
##
## $reUse
##                            Estimate Std. Error      t value      Pr(>|t|)
## Intercept                1.258562e-17 0.06121557  2.055951e-16 1.0000000000
## playfulness              6.410970e-02 0.08145257  7.870801e-01 0.4321439870
## innovativeness           1.225978e-01 0.08411986  1.457418e+00 0.1465310902
## robotSE                  5.362317e-03 0.07109505  7.542461e-02 0.9399504286
## ageNum                   5.164431e-02 0.06220318  8.302519e-01 0.4073622283
## trustingstance           4.374535e-02 0.06572676  6.655638e-01 0.5064381314
## genderNum               -1.528419e-01 0.06495830 -2.352924e+00 0.0195735209
## eduNum                   2.232076e-01 0.06282911  3.552615e+00 0.0004732779
## IntentOfUsageContinuat   2.648944e-01 0.07073245  3.745020e+00 0.0002343604
```

3.4 Direct relationships

It is also possible to list all direct relationships within the model itself

```
##                                                    direct       indirect
## anthroTreat -> InitialTechTrustExpect           -0.119086248  0.0000000000
## empathTreat -> InitialTechTrustExpect            0.119048473  0.0000000000
## treatAnthroEmpath -> InitialTechTrustExpect      0.016313583  0.0000000000
## treatAnthroInter -> PostIncTechTrustExpect      -0.080217178  0.0000000000
## treatEmpathInter -> PostIncTechTrustExpect      -0.112851835  0.0000000000
## anthro -> InitialTechTrustExpect                -0.156639624  0.0000000000
## empathy -> InitialTechTrustExpect               -0.009027037  0.0000000000
## AnthroEmpath -> InitialTechTrustExpect           0.500243391  0.0000000000
## interEmpath -> PostIncTechTrustExpect            0.187911002  0.0000000000
## interAnthro -> PostIncTechTrustExpect            0.202625831  0.0000000000
## servFailure -> PostIncTechTrustExpect           -0.307813466  0.0000000000
## InitialTechTrustExpect -> PostIncTechTrustExpect 0.512432475  0.0000000000
## PostIncTechTrustExpect -> PostIncTechTrustPerfor 0.678478851  0.0000000000
## PostIncTechTrustExpect -> PostIncTechTrustDiconf 0.080025685  0.4235461981
## PostIncTechTrustExpect -> PostIncTechTrustSatisf 0.184553753  0.2702324841
## PostIncTechTrustPerfor -> PostIncTechTrustDiconf 0.624258512  0.0000000000
## PostIncTechTrustPerfor -> PostIncTechTrustSatisf 0.249421057  0.1252126863
## PostIncTechTrustPerfor -> PostIncTechTrustIntent 0.431166142  0.1069633253
## PostIncTechTrustDiconf -> PostIncTechTrustSatisf 0.200578260  0.0000000000
## PostIncTechTrustDiconf -> PostIncTechTrustIntent 0.012354766  0.0531386844
## PostIncTechTrustSatisf -> PostIncTechTrustIntent 0.264927437  0.0000000000
## PostIncTechTrustSatisf -> IntentOfUsageContinuat 0.041538362  0.1448792960
## PostIncTechTrustIntent -> IntentOfUsageContinuat 0.546864068  0.0000000000
## playfulness -> IntentOfUsageContinuat            0.030475292  0.0000000000
## playfulness -> reUse                             0.064109696  0.0080727355
## innovativeness -> IntentOfUsageContinuat         0.109803333  0.0000000000
```

```
## innovativeness -> reUse                        0.122597822  0.0290862923
## robotSE -> IntentOfUsageContinuat              0.210234731  0.0000000000
## robotSE -> reUse                               0.005362317  0.0556900112
## ageNum -> IntentOfUsageContinuat               0.007798083  0.0000000000
## ageNum -> reUse                                0.051644308  0.0020656689
## trustingstance -> IntentOfUsageContinuat      -0.000981630  0.0000000000
## trustingstance -> reUse                        0.043745349 -0.0002600283
## genderNum -> IntentOfUsageContinuat            0.077676362  0.0000000000
## genderNum -> reUse                            -0.152841945  0.0205760365
## eduNum -> IntentOfUsageContinuat              -0.028566360  0.0000000000
## eduNum -> reUse                                0.223207624 -0.0075670698
## IntentOfUsageContinuat -> reUse                0.264894440  0.0000000000
```

3.5 Pseudo-goodness of fit of the model

The pseudo goodness-of-fit is higher compared to the former model by 4%, which means more variance is explained.

```
anthroModel4$gof
```

```
## [1] 0.5175019
```

3.6 Inner model summary

Here is the inner model summary listed with the respective r-squares and other respective values. This table corresponds to table 6 in the thesis.

```
##              Parameter        R2       AVE Block_Communality
## 1 InitialTechTrustExpect 0.1471959 0.6944127         0.6944127
## 2 PostIncTechTrustExpect 0.4212263 0.7228580         0.7228580
## 3 PostIncTechTrustPerfor 0.4603336 0.6533800         0.6533800
## 4 PostIncTechTrustDiconf 0.4638920 0.6831187         0.6831187
## 5 PostIncTechTrustSatisf 0.3041415 0.6836856         0.6836856
## 6 PostIncTechTrustIntent 0.3831834 0.8319687         0.8319687
## 7 IntentOfUsageContinuat 0.5109704 0.7711321         0.7711321
## 8                  reUse 0.2317941 1.0000000         1.0000000
```

4. Halo Effect

As described by Oliver (2014), a halo effect can come into place when there is a positive correlation between Disconfirmation and expectations. This will be tested here. Following values will be the r-value and the p-value of the correlation test:

```
## [1] 0.504843
```

```
## [1] 3.063216e-15
```

5. Cross-loadings table

The cross-loadings table is too large to put it into a table. The data is saved in the file: CrossLoadingsTable.csv

6. Randomisation Check

Here we want to see whether the group variable, i.e. the treatment groups where each participant was assigned to, is able to predict either gender, age or education. This was not the case however (Compare F-Statistic in case of each model summary).

6.1 Gender, Age and Education

```
##
## Call:
## lm(formula = genderNum ~ group, data = MCdat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.6200 -0.5893  0.3800  0.4107  0.5472
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.58929    0.07123  22.312   <2e-16 ***
## groupAN     -0.13646    0.10215  -1.336    0.183
## groupNE      0.01071    0.10119   0.106    0.916
## groupNN      0.03071    0.10371   0.296    0.767
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.533 on 210 degrees of freedom
## Multiple R-squared:  0.01516,    Adjusted R-squared:  0.001091
## F-statistic: 1.078 on 3 and 210 DF,  p-value: 0.3596


##
## Call:
## lm(formula = eduNum ~ group, data = MCdat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6909 -0.8214  0.1786  1.1786  2.5600
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.8214     0.1649  23.172   <2e-16 ***
## groupAN      -0.1422     0.2365  -0.601    0.548
## groupNE      -0.1305     0.2343  -0.557    0.578
## groupNN      -0.3814     0.2401  -1.589    0.114
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.234 on 210 degrees of freedom
## Multiple R-squared:  0.0122, Adjusted R-squared:  -0.001915
## F-statistic: 0.8643 on 3 and 210 DF,  p-value: 0.4605


##
## Call:
## lm(formula = ageNum ~ group, data = MCdat)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.7358 -0.5818 -0.3571  0.4182  3.6429
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.3571     0.1437  16.399   <2e-16 ***
## groupAN       0.3787     0.2061   1.837   0.0676 .
## groupNE       0.2247     0.2042   1.100   0.2725
## groupNN       0.1829     0.2093   0.874   0.3833
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.076 on 210 degrees of freedom
## Multiple R-squared:  0.01609,    Adjusted R-squared:  0.002036
## F-statistic: 1.145 on 3 and 210 DF,  p-value: 0.332
```

6.2 Techn. Playfulness and Innovativeness

```
##
## Call:
## lm(formula = techhnologyInnovativeness ~ group, data = MCdat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.0409 -0.7909  0.2091  0.9591  2.4911
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.50893    0.16602  27.159   <2e-16 ***
## groupAN     -0.26365    0.23809  -1.107    0.269
## groupNE      0.28198    0.23585   1.196    0.233
## groupNN      0.01107    0.24173   0.046    0.964
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.242 on 210 degrees of freedom
## Multiple R-squared:  0.02421,    Adjusted R-squared:  0.01027
## F-statistic: 1.737 on 3 and 210 DF,  p-value: 0.1605


##
## Call:
## lm(formula = technologyPlayfulness ~ group, data = MCdat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.0081 -0.4571  0.1348  0.6673  2.0408
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.95918    0.12316  40.265   <2e-16 ***
## groupAN      0.19176    0.17663   1.086    0.279
```

```
## groupNE        0.16289      0.17497    0.931      0.353
## groupNN        0.06939      0.17933    0.387      0.699
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9217 on 210 degrees of freedom
## Multiple R-squared:  0.007036,   Adjusted R-squared:  -0.007149
## F-statistic: 0.496 on 3 and 210 DF,  p-value: 0.6854
```

6.3 Trusting Stance and Robot Self-Efficacy

```
##
## Call:
## lm(formula = generalTrustingStance ~ group, data = MCdat)
##
## Residuals:
##     Min     1Q  Median      3Q     Max
## -3.6855 -0.7333  0.1488  0.8155  2.2667
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.8512     0.1479  32.807   <2e-16 ***
## groupAN      -0.1657     0.2121  -0.781    0.436
## groupNE      -0.1179     0.2101  -0.561    0.575
## groupNN      -0.1645     0.2153  -0.764    0.446
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.107 on 210 degrees of freedom
## Multiple R-squared:  0.00385,    Adjusted R-squared:  -0.01038
## F-statistic: 0.2705 on 3 and 210 DF,  p-value: 0.8466


##
## Call:
## lm(formula = robotSelfEfficacy ~ group, data = MCdat)
##
## Residuals:
##      Min      1Q   Median      3Q      Max
## -2.20755 -0.55189  0.06667  0.57023  2.44444
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.62897    0.10970  42.195   <2e-16 ***
## groupAN     -0.08809    0.15732  -0.560    0.5761
## groupNE     -0.02897    0.15585  -0.186    0.8527
## groupNN     -0.29563    0.15973  -1.851    0.0656 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8209 on 210 degrees of freedom
## Multiple R-squared:  0.01912,    Adjusted R-squared:  0.005103
## F-statistic: 1.364 on 3 and 210 DF,  p-value: 0.2548
```

7. Manipulation Check

Here we want to see whether the treatment is able to predict the perceived variables, the treatment should have influneced. In other words, Anthropomorphic advisors should significantly predict the perceived anthropomorphism as well as empathy should predict the perceived empathy.

```
##
##  Kruskal-Wallis rank sum test
##
## data:  MCAnthro by anthropo
## Kruskal-Wallis chi-squared = 71.74, df = 1, p-value < 2.2e-16


##
## Call:
## lm(formula = MCAnthro ~ anthropo, data = anthro)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.3853 -0.8921 -0.0520  0.9480  3.4413
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.8921     0.1263   22.91   <2e-16 ***
## anthropo1     1.8266     0.1769   10.32   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.294 on 212 degrees of freedom
## Multiple R-squared:  0.3346, Adjusted R-squared:  0.3315
## F-statistic: 106.6 on 1 and 212 DF,  p-value: < 2.2e-16


##
##  Kruskal-Wallis rank sum test
##
## data:  MCEmpath by empathy
## Kruskal-Wallis chi-squared = 4.6183, df = 1, p-value = 0.03163


##
## Call:
## lm(formula = MCEmpath ~ empathy, data = empath)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.3934 -0.9806  0.0194  1.0194  2.6861
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.9806     0.1406  28.315   <2e-16 ***
## empathy1      0.4128     0.1952   2.115   0.0356 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.427 on 212 degrees of freedom
## Multiple R-squared:  0.02066,    Adjusted R-squared:  0.01604
## F-statistic: 4.472 on 1 and 212 DF,  p-value: 0.03561
```

8. Cronbach's Alpha of various constructs

8.1 Control Variables

Listed are the alpha values for each item and construct.

```
## [1] "Playfulness"


##  raw_alpha std.alpha  G6(smc) average_r       S/N       ase      mean        sd
##  0.8252797 0.8285742 0.8470105 0.4084555 4.833429 0.0185648 5.064753 0.9183925
##    median_r
##  0.3722383


## [1] "innovativeness"


##  raw_alpha std.alpha  G6(smc) average_r       S/N       ase      mean        sd
##  0.8169481 0.8221126 0.7860175 0.5360455 4.621534 0.02068991 4.518692 1.248803
##    median_r
##  0.5266215


## [1] "Trusting Stance"


##  raw_alpha std.alpha  G6(smc) average_r       S/N       ase      mean        sd
##  0.6381514 0.6209812 0.622271 0.3532241 1.638392 0.0420901 4.741433 1.100868
##    median_r
##  0.1763577


## [1] "Robot Self-efficacy"


##  raw_alpha std.alpha  G6(smc) average_r       S/N       ase      mean        sd
##  0.7624981 0.7705992 0.767025 0.2717965 3.359183 0.0242029 4.530633 0.8230449
##  median_r
##  0.262069


## [1] "Trusting stance towards agent"


##  raw_alpha std.alpha   G6(smc) average_r       S/N        ase      mean        sd
##  0.7811789 0.7788755 0.7444564 0.5400423 3.522339 0.02624931 4.775701 1.165739
##    median_r
##  0.5094026
```

8.2 Experimental Variables

```
## [1] "Trusting expectations reliability"


##  raw_alpha std.alpha   G6(smc) average_r       S/N        ase      mean        sd
##  0.4980015 0.4815779 0.438932 0.2364334 0.9289302 0.05733799 3.825545 0.9634378
##    median_r
##  0.2204936
```

```
## [1] "Trusting expectations functionality"

##  raw_alpha std.alpha  G6(smc) average_r      S/N       ase     mean        sd
##  0.8582111 0.8594787 0.803758 0.6709212 6.116359 0.0167646 5.08567 0.9884214
##  median_r
##  0.668094


## [1] "Trusting expectations helpfulness"

##  raw_alpha std.alpha  G6(smc) average_r      S/N       ase      mean        sd
##  0.8067678 0.8132087 0.750524 0.5920349 4.353569 0.02301672 4.880062 1.050448
##  median_r
##  0.585261


## [1] "Post incident trusting expectations functionality"

##  raw_alpha std.alpha   G6(smc) average_r      S/N        ase      mean        sd
##  0.9017229 0.9020932 0.8601293 0.7543761 9.213796 0.01159966 4.643302 1.183689
##   median_r
##  0.7567785


## [1] "Post incident trusting expectations helpfulness"

##  raw_alpha std.alpha   G6(smc) average_r      S/N        ase      mean        sd
##  0.8720446  0.874562 0.8260535 0.6991597 6.972067 0.01519472 4.503115 1.189302
##   median_r
##  0.7003064


## [1] "Post incident trusting expectations functionality"

##  raw_alpha std.alpha   G6(smc) average_r      S/N        ase      mean        sd
##  0.8385851 0.8403213 0.7863802 0.6369171 5.262575 0.01935732 3.732087 1.106192
##   median_r
##  0.6137763


## [1] "Post incident trusting expectations disconfirmation functionality"

##  raw_alpha std.alpha   G6(smc) average_r      S/N        ase      mean        sd
##  0.8921638  0.892798 0.8487259 0.7351738 8.328184 0.01279171 3.976636 1.029038
##   median_r
##  0.7405318


## [1] "Post incident trusting expectations disconfirmation helpfulness"

##  raw_alpha std.alpha   G6(smc) average_r     S/N        ase      mean        sd
##   0.820792 0.8212821 0.7590691 0.6050246 4.59541 0.02106614 4.137072 1.033051
##   median_r
##  0.6291511


## [1] "Post incident trusting expectations disconfirmation functionality"
```

```
## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
## 0.8088691   0.812521 0.7478242 0.5909424 4.33393 0.02261863 3.920561 0.9670756
##   median_r
## 0.5930758


## [1] "Post incident trusting performance functionality"


## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
## 0.8045311 0.8048728 0.7427693 0.5789392 4.124862 0.02331581 4.419003 1.167474
##   median_r
## 0.5792844


## [1] "Post incident trusting performance helpfulness"


## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
## 0.8846169 0.8846349 0.8458109 0.7187886 7.668131 0.01384709 4.283489 1.259956
##   median_r
## 0.7152433


## [1] "Post incident trusting performance reliability"


## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
## 0.6867658 0.6882462 0.6192051 0.4239255 2.20766 0.03754192 3.554517 1.209374
##   median_r
## 0.4230705


## [1] "tech satisfaction"


## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
##   0.84346 0.8456133 0.8122458 0.5779363 5.477242 0.01723602 4.238318 0.8299578
##   median_r
## 0.5607662


## [1] "tech trusting intentions"


## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
## 0.8987035 0.8990474 0.8560787 0.7480185 8.905637 0.01194602 4.05296 1.270548
##   median_r
## 0.7492029


## [1] "usage continuation intention"


## raw_alpha std.alpha  G6(smc) average_r      S/N      ase     mean       sd
## 0.8505121 0.8517742 0.7963708 0.6570042 5.746463 0.01777961 4.327103 1.331753
## median_r
## 0.664039
```

8.3 Constructs for Manipulation Check

```
## [1] "Antrhopomorphism"
```

```
##  raw_alpha std.alpha   G6(smc) average_r       S/N        ase     mean       sd
##  0.7275112 0.7289545 0.6487572 0.4727053 2.689418 0.03246442 3.82243 1.582255
##   median_r
##  0.4479998
```

```
## [1] "Empathy"
```

```
##  raw_alpha std.alpha   G6(smc) average_r       S/N        ase     mean      sd
##  0.7845865 0.7851694 0.7125568 0.5491997 3.654831 0.02554597 4.194704 1.43835
##   median_r
##  0.5549306
```