Final project

Question one: Include 5 latent vairables and approximately three indicators or more per latent variable. The use of 5-7 latent variables is a suggestion, but use more if your model has more variables in it. Your model could also include a combination of observed variables

In my data, I have included three latent variables. They are visual merchandising cues, Flow, and behavioral outcomes. First latent variable Visual merchandising cues include 5 indicators or observed variables. They are image quality, interactivity, richness, craftsmanship, and website advetisement.Another latent variable, Flow includes two observed variables: Teleprsence and enjoyment. The other latent variable behavioral outcomes include two indicators and they are satsfaction and approach/avoidance behavior.

Question two: Describe each conceptual variable in your model, how it has been operationalized by previous research, and how you are operationalizing it.

Visual merchandising cues are the comibination of observed variables related to product presentation and website layout.Image quality influences consumers' emotions. Consumers may envision themselves if they see a model in a site (Kim et al., 2012). Interactivity refers to the manipulation of products, which influences telepresence and engagement (Steur, 1992). Richness refers to complexity and multi-sensory elements of a site (Deng & Poole, 2010). Web advertising includes promotional text, graphics, and banner ads on the website (Wu, 2014).Craftsmanship refers to skills to use the wesbite. Another latent variable is Flow. Mollen and Wilson (2003) define flow as a mental state that results in an active cognitive processing. It influences our instrumental value (utility, relevance) and experiential value (emotional bonding, pleasure, satisfaction, and emotional congruence). It includes two indicators and they are enjoyment and teleprsence. Enjoyment provides consumers pleasurable shopping experiences (Kim et al., 2015). Another indicator, teleprsence, refers to have a realistic experience in a sit just like the real world shopping experience, the final latent variable is behavioral outcomes and it has been measued by two observed variables and they are satisfaction and approach/avoidance behavior. I am operationalizing all measured varibles and they are given

Product image quality (Koo & Ju, 2010), 0.85

The website looks nice because of the product image quality.

The product image quality is good.

The product image quality is visually comforting.

Interactivity of product presentation (Van & Verhagenn, 2004), 0.88

Interactivity of product presentation is appropriate.

Interactivity of product presentation is lively.

Interactivity of product presentation is engaging.

Interactivity of product presentation is stimulating.

Website's advertisement (Vann & Verhagen, 2004), 0.84

The banner ads and promotional text have clear messages.

The banner ads and promotional text are knowledgeable.

The banner ads and promotional text are engaging.

Richness

The layout is pleasantly varied

The layout is inventive

The design appears uninspired

The layout appears dynamic

The design is uninteresting

Craftsmanship

The layout appears professional designed

The layout is not up-to-date the site is designed with care

The design of the site lacks a concept

Satisfaction (Eroglu et al., 2001, 0.89)

I am very satisfied with the information I receive from the Forever 21 website.

I have a positive attitude toward the Forever 21 website surfing.

My interaction with the Forever 21 website is very satisfying.

Approach/avoidance behavior (Eroglu et al., 2001, 0.94)

How much time would you like to spend with the Forever 21 website once at the site,

How much did you enjoy exploring around?

How much would you like to use this particular site while shopping?

Once at the site, how much would you like to look around or explore the site?

Enjoyment

When I was browsing in the Forever 21 website, I felt totally captivated

When I was navigating the Forever 21 website, time seemed to pass very quickly

When I visited the Forever 21 website, nothing seemed to matter to me

Teleprsence

I am in physical world during my shopping

I feel I have obtained real world shopping experience

Question three: Briefly explain why the relations among the conceptual variables are of interest to researchers and you and what already is known and not known.

I am using the S-O-R frameworks to conduct this study. This S-O-R framework is explained by Mehrabrian and Russell (1974). This framework is used to analyze the effects of visual merchandising cues on consumers' flow experience and behavioral outcomes. Eroglu et al (2001) stated that, stimulus(S) refers to all visible and audible cues which affect consumers' internal or perceptual states. Organism is defined as consumers' affective and cognitive states and it plays the role as a mediator. And the response is behavioral outcomes. In my model, the stimulus is visual merchandising cues which include five indicators. Also, the organism is flow which is measured through enjoyment and telepresence. And my response variable is behavioral outcomes which is measured through satisfaction and approach behavior. Flow is defined as consumers' cognitive states. Limited research has been done to understand the role of visual merchandising cues on flow as well as behavioral outcomes. As noted by Hsu et al (2012), website quality has a significant effect on flow which influences consumers' satisfaction and purchase e intention. The website quality is investigated by previous researchers. Therefore, I am bringing the gap of previous studies by analyzing the effect of visual merchandising cues on consumers' flow experience and behavioral outcomes. Based on the S-O-R framework, the following hypotheses are presented: H1: Visual merchandising cues will positively influence or have an effect on consumer flow experience and behavioral outcomes H2: Visual merchandising cues will positively influence or have an effect on behavioral outcomes H3: Flow mediate the relationship between visual merchandising cues and behavioral outcomes. Because of these, I explain the relations among the conceptual variables and it brings an interest to me. These relations are not established by previous research and I would like to think about.

Question four: Draw a structural equation model/path diagram for your model using RAM notation and justify (briefly) the paths among the latent variables (including the relations among exogenous variables).

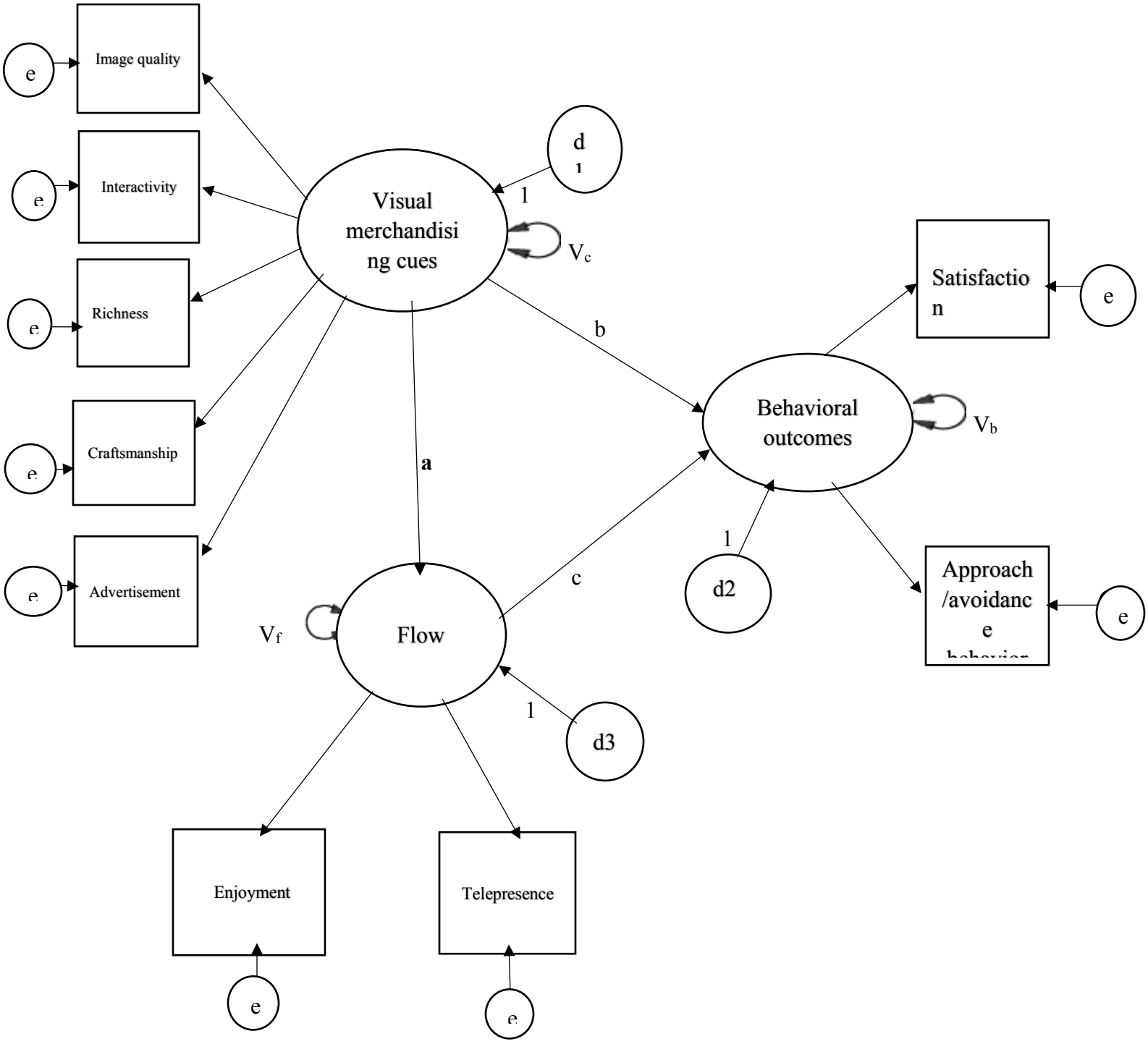


Figure one: The path modeling diagram using the RAM notation

Justification of the paths among the latent variables (including the relations among exogenous variables>

In this model, the exogenous variable is visual merchandising cues which has five indicators. And the other latent variables are flow and behavioral outcomes. Flow and behavioral outcomes are endogenous variables. Based on the SOR framework, the exogenous latent variable, visual merchandising cues have a direct and positive effect on flow and behavioral outcomes. The endogenous variable flow will mediate the relationship between visual merchandising cues and behavioral outcomes. It means that the visual merchandising cues will have also indirect effect on behavioral outcomes through consumer flow experience. Here, the observed variables are image quality, interactivity, richness, craftsmanship, advertisement, enjoyment, telepresence, satisfaction, and approach/avoidance behavior.

Question five: As needed, expand on what you wrote in response to #2 in defining your measurement model. Explain any residual covariance among indicators or complex structure. You may not have any have.

Here. The exogenous variable is visual merchandising cues

Let, ξ_1 represent the exogenous variable visual merchandising cues

x_1 = image quality

x_2 = interactivity

x_3 = richness

x_4 = craftsmanship

x_5 = advertisement

here, x_1 to x_5 are all observed or measured variables for the exogenous variable visual merchandising cues.

Let, η_1 represent the endogenous variable flow and η_2 represent the endogenous variable behavioral outcomes.

y_1 = enjoyment, y_2 = telepresence, y_3 = satisfaction, and y_4 = approach/avoidance behavior

The measurement model is given here:

$$x_1 = \lambda_1\xi_1 + \delta_1$$

$$x_2 = \lambda_2\xi_1 + \delta_2$$

$$x_3 = \lambda_3\xi_1 + \delta_3$$

$$x_4 = \lambda_4\xi_1 + \delta_4$$

$x_5 = \lambda_5 \xi_1 + \delta_5$

$y_1 = \lambda_6 \eta_1 + \epsilon_1$

$y_2 = \lambda_7 \eta_1 + \epsilon_2$

$y_3 = \lambda_8 \eta_2 + \epsilon_3$

$y_4 = \lambda_9 \eta_2 + \epsilon_4$

This is actually the measurement model, which is very important to understand.

Here, the λ_s are the factor loadings and δ_s and ϵ_s are the measurement errors for the exogenous and endogenous variables, respectively.

This is actually the measurement model. We do not count the residual covariance among the indicators in our model.

The measurement model which is described in lavaan

measurement model
Visual merchandising cues =~ x1 + x2 + x3 + x4+ x5
Flow =~ y1 + y2
Behavioral outcomes =~ y3 + y4

Question six: If at all possible, describe/justify and provide diagrams for at least two equivalent models - but you only need to set up matrices and R code for your model of interest.

In my view, I have found two equivalent models for my study. First, I am setting up the matrices and

R code for my model of interest

```
originalmod= '
visualcues =~ QL +INT +RICH+CRA+AD
flow =~ EN+TEL
BO =~SAT+APP

flow~ a*visualcues
BO ~ c*flow + b*visualcues

ac := a*c


'
equmodone= '
visualcues =~ QL +INT +RICH+CRA+AD
```

```
flow =~ EN+TEL
BO =~SAT+APP

visualcues~ a*flow
BO ~ c*flow + b*visualcues

ac := a*c

'
equmodtwo= '
visualcues =~ QL +INT +RICH+CRA+AD
flow =~ EN+TEL
BO =~SAT+APP

flow~ a*visualcues+c*BO
visualcues ~  b*BO

ac := a*c

'
##   chisq      df   rmsea     cfi     tli
## 279.323  24.000   0.218   0.844   0.767
```

My original model I have shown in R code with covariance matrix

```
lower= '
1.145
0.986     1.511
0.912     1.167       1.603
1.071     1.289       1.419     2.457
0.924     0.969       1.219     1.229    1.399
0.944     0.993       1.395     1.274    1.184   1.721
0.868     0.978       1.017     1.086    0.906   1.002     1.145
0.396     0.496       0.635     0.408    0.547   0.816     0.596
 1.722
0.459     0.127       0.489     0.252    0.261   0.312     0.448
 0.383     1.459

'

beth = getCov(lower, names=c("QL","INT","RICH","CRA","AD","EN","SAT","
```

```
APP","TEL"))


originalmod= '
visualcues =~ QL +INT +RICH+CRA+AD
flow =~ EN+TEL
BO =~SAT+APP

flow~ a*visualcues
BO ~ c*flow + b*visualcues

ac := a*c


'
fit = sem(model = originalmod, sample.cov=beth, sample.nobs = 224)

fitMeasures(fit, c("chisq", "df", "p", "rmsea", "cfi", "tli","srmr
"))

##   chisq      df   rmsea     cfi     tli
## 279.323  24.000   0.218   0.844   0.767
```

I have shown here my first equivalent model here

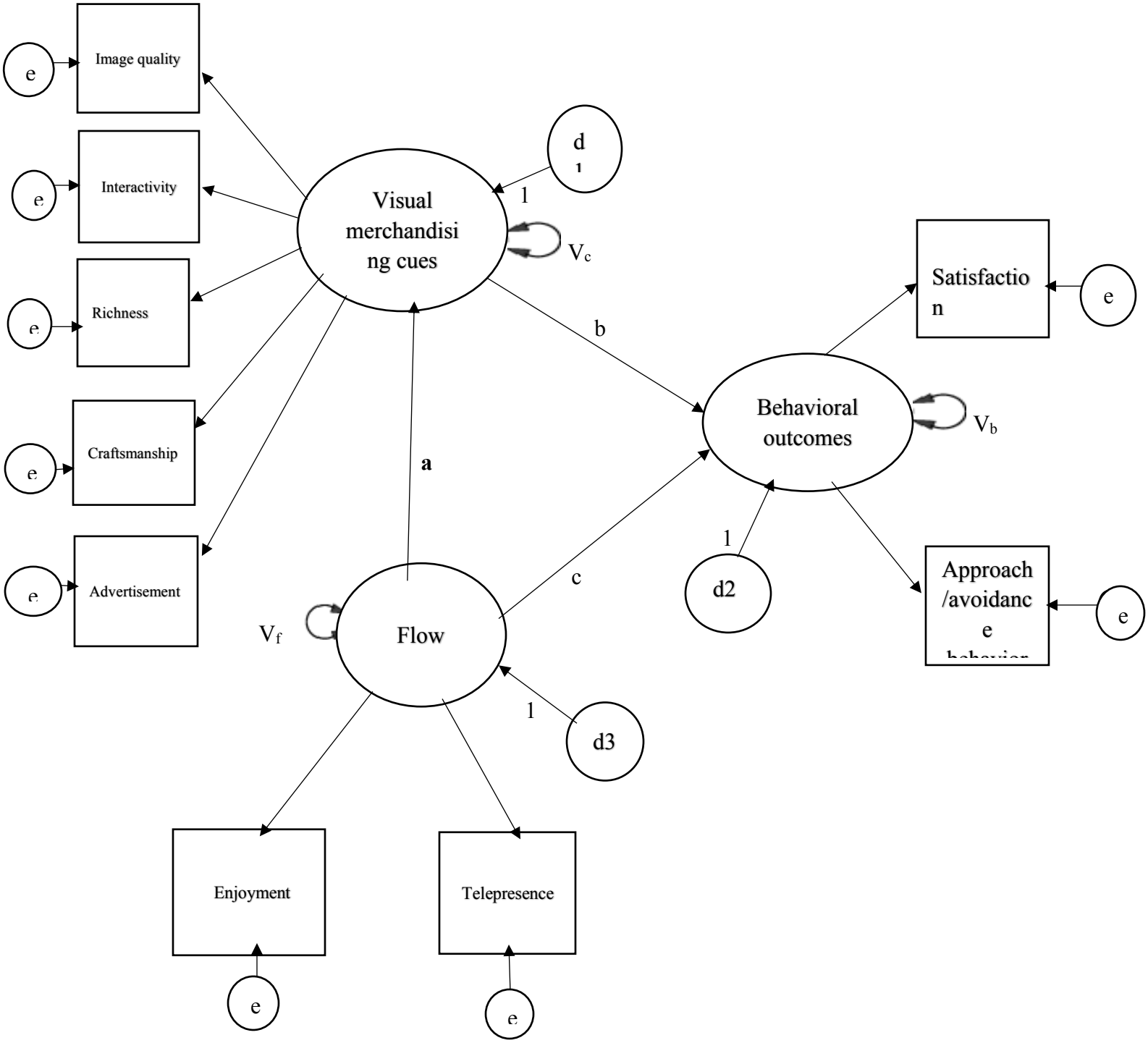
```
equmodone= '
visualcues =~ QL +INT +RICH+CRA+AD
flow =~ EN+TEL
BO =~SAT+APP

visualcues~ a*flow
BO ~ c*flow + b*visualcues

ac := a*c


'
fit = sem(model = equmodone, sample.cov=beth, sample.nobs = 224)

fitMeasures(fit, c("chisq", "df", "p", "rmsea", "cfi", "tli","srmr
"))

##   chisq      df   rmsea     cfi     tli
## 279.323  24.000   0.218   0.844   0.767

equmodtwo= '
visualcues =~ QL +INT +RICH+CRA+AD
flow =~ EN+TEL
```

```
BO =~SAT+APP

flow~ a*visualcues+c*BO
visualcues ~  b*BO

ac := a*c


'
fit = sem(model = equmodtwo, sample.cov=beth, sample.nobs = 224)

## Warning in lav_object_post_check(object): lavaan WARNING: some esti
mated lv
## variances are negative

fitMeasures(fit, c("chisq", "df", "p", "rmsea", "cfi", "tli","srmr
"))

##   chisq      df   rmsea     cfi     tli
## 279.323  24.000   0.218   0.844   0.767
```

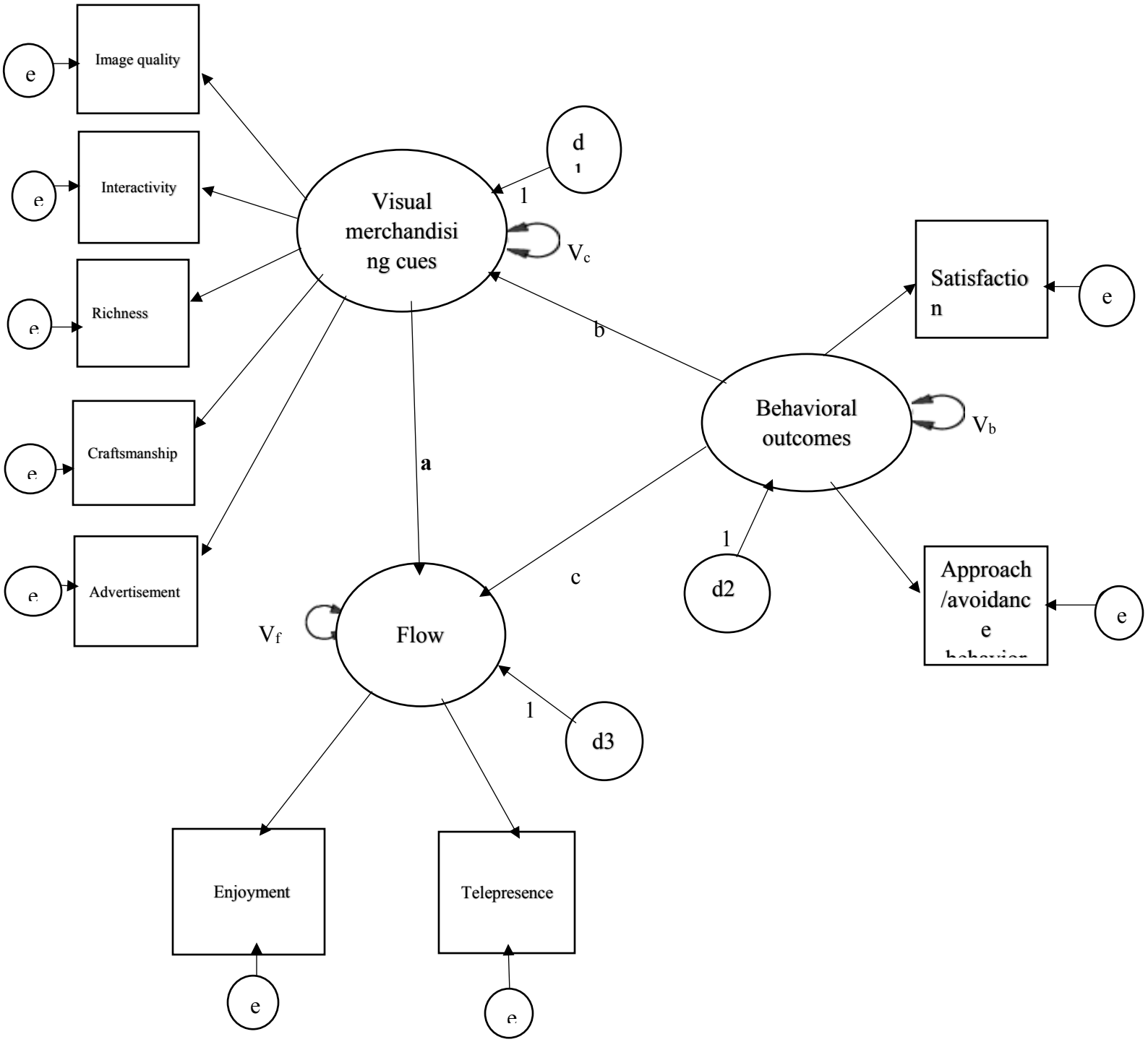
In my original model, I have measured the effect of visual cues on flow and the effect of visual cues and flow on behavioral outcomes. In my first equivalent model, I have measured the effect of flow on visual cues and the effect of visual cues and flow on behavioral outcomes. I have got the same chi square vale, degrees of freedom, RMSEA value, cfi, and tli value. In my second equivalent model, I have measured the effect of visual cues and behavioral outcomes on flow and the effect of behavioral outcomes on visual cues and I have received the same values for each model.

```
originalmod= '
flow~ a*visualcues
BO ~ c*flow + b*visualcues

ac := a*c

'
equmodone= '

visualcues~ a*flow
BO ~ c*flow + b*visualcues

ab := a*b

'
equmodtwo= '
```

```
flow~ a*visualcues+c*BO
visualcues ~  b*BO

ba := b*a
'

Equivalent model one
```



equivalent model two



Question seven: Write the equations for your model using LISREL notation

Firstly, the measurement model is expressed using LISREL notation

$$x = \Lambda_x \xi + \delta$$
$$y = \Lambda_y \eta + \epsilon$$

$$x = \begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \\ x5 \end{bmatrix} \quad \Lambda_x = \begin{bmatrix} \lambda 1 \\ \lambda 2 \\ \lambda 3 \\ \lambda 4 \\ \lambda 5 \end{bmatrix}, \quad \delta = \begin{bmatrix} \delta 1 \\ \delta 2 \\ \delta 3 \\ \delta 4 \\ \delta 5 \end{bmatrix}, \quad \xi = [\xi 1]$$

$$y = \begin{bmatrix} y1 \\ y2 \\ y3 \\ y4 \end{bmatrix}, \quad \epsilon = \begin{bmatrix} \epsilon 1 \\ \epsilon 2 \\ \epsilon 3 \\ \epsilon 4 \end{bmatrix}, \eta = \begin{bmatrix} \eta 1 \\ \eta 2 \end{bmatrix},$$

The structural component is written in lisrel notation

$$\eta = \beta\eta + \Gamma\, \xi + \zeta$$

$$\eta = \begin{bmatrix} \eta 1 \\ \eta 2 \end{bmatrix}$$

Question 8: Set up the lavaan syntax for your model

```
library(lavaan)

## This is lavaan 0.6-3

## lavaan is BETA software! Please report any bugs.
```

```
lower= '
1.145
0.986     1.511
0.912     1.167       1.603
1.071     1.289       1.419     2.457
0.924     0.969       1.219     1.229    1.399
0.944     0.993       1.395     1.274    1.184   1.721
0.868     0.978       1.017     1.086    0.906   1.002     1.145
0.396     0.496       0.635     0.408    0.547   0.816     0.596    1.
722
0.459     0.127       0.489     0.252    0.261   0.312     0.448    0.
383  1.459
'

beth = getCov(lower, names=c("QL","INT","RICH","CRA","AD","EN","SAT","
APP","TEL"))
 print(beth)

##         QL   INT  RICH   CRA    AD    EN   SAT   APP   TEL
## QL   1.145 0.986 0.912 1.071 0.924 0.944 0.868 0.396 0.459
## INT  0.986 1.511 1.167 1.289 0.969 0.993 0.978 0.496 0.127
## RICH 0.912 1.167 1.603 1.419 1.219 1.395 1.017 0.635 0.489
## CRA  1.071 1.289 1.419 2.457 1.229 1.274 1.086 0.408 0.252
## AD   0.924 0.969 1.219 1.229 1.399 1.184 0.906 0.547 0.261
## EN   0.944 0.993 1.395 1.274 1.184 1.721 1.002 0.816 0.312
## SAT  0.868 0.978 1.017 1.086 0.906 1.002 1.145 0.596 0.448
## APP  0.396 0.496 0.635 0.408 0.547 0.816 0.596 1.722 0.383
## TEL  0.459 0.127 0.489 0.252 0.261 0.312 0.448 0.383 1.459

mod= '
visualcues =~ QL +INT +RICH+CRA+AD
flow =~ EN+TEL
BO =~SAT+APP

flow~ a*visualcues
BO ~  b*visualcues + c*flow

ac := a*c

'
fit = sem(model = mod, sample.cov=beth, sample.nobs = 224)

## Warning in lav_object_post_check(object): lavaan WARNING: some esti
mated lv
## variances are negative

summary(fit, fit.measures=TRUE,standardized=TRUE)
```

```
## lavaan 0.6-3 ended normally after 37 iterations
##
##   Optimization method                           NLMINB
##   Number of free parameters                         21
##
##   Number of observations                           224
##
##   Estimator                                         ML
##   Model Fit Test Statistic                     279.323
##   Degrees of freedom                                24
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             1676.627
##   Degrees of freedom                                36
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.844
##   Tucker-Lewis Index (TLI)                       0.767
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -2589.100
##   Loglikelihood unrestricted model (H1)      -2449.438
##
##   Number of free parameters                         21
##   Akaike (AIC)                                5220.199
##   Bayesian (BIC)                              5291.844
##   Sample-size adjusted Bayesian (BIC)         5225.292
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.218
##   90 Percent Confidence Interval          0.195  0.241
##   P-value RMSEA <= 0.05                          0.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.057
##
## Parameter Estimates:
##
##   Information                                 Expected
```

```
##   Information saturated (h1) model          Structured
##   Standard Errors                             Standard
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##   visualcues =~

##     QL                1.000                               0.870
0.815
##     INT               1.143    0.080   14.319    0.000    0.995
0.811
##     RICH              1.335    0.077   17.396    0.000    1.162
0.920
##     CRA               1.376    0.104   13.191    0.000    1.197
0.766
##     AD                1.178    0.074   15.893    0.000    1.026
0.869
##   flow =~

##     EN                1.000                               0.972
0.743
##     TEL               0.328    0.073    4.485    0.000    0.319
0.265
##   BO =~

##     SAT               1.000                               0.984
0.921
##     APP               0.613    0.090    6.806    0.000    0.603
0.461
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##   flow ~

##     visualcues (a)    1.288    0.083   15.482    0.000    1.153
1.153
##   BO ~

##     visualcues (b)    1.123    0.148    7.567    0.000    0.994
0.994
##     flow       (c)   -0.065    0.106   -0.616    0.538   -0.065   -
0.065
##
## Variances:
```

```
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##    .QL                0.382    0.040    9.476    0.000    0.382
0.335
##    .INT               0.515    0.054    9.511    0.000    0.515
0.342
##    .RICH              0.245    0.033    7.434    0.000    0.245
0.154
##    .CRA               1.013    0.103    9.796    0.000    1.013
0.414
##    .AD                0.341    0.039    8.842    0.000    0.341
0.245
##    .EN                0.768    0.191    4.017    0.000    0.768
0.448
##    .TEL               1.350    0.129   10.467    0.000    1.350
0.930
##    .SAT               0.172    0.084    2.060    0.039    0.172
0.151
##    .APP               1.351    0.131   10.288    0.000    1.351
0.788
##     visualcues        0.757    0.103    7.351    0.000    1.000
1.000
##    .flow             -0.311    0.180   -1.730    0.084   -0.329   -
0.329
##    .BO                0.151    0.085    1.778    0.075    0.156
0.156
##
## Defined Parameters:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##     ac               -0.084    0.136   -0.618    0.536   -0.075   -
0.075
```

```
fitMeasures(fit, c("chisq", "df", "p", "rmsea", "cfi", "tli","srmr
"))
```

```
##   chisq      df   rmsea     cfi     tli     srmr
## 279.323  24.000   0.218   0.844     0.767   0.057
```

Question nine:

Model's overall fit:

```
     chisq      df   rmsea     cfi     tli     srmr
    279.323   24.000 0.218   0.844    0.767   0.057
```

The Chi-square test of model fit is 279.323. The CFI value is 0.844 and the TLI is 0.767. The RMSEA is 0.218 and SRMR is 0.057. The value for CFI and TLI that are 0.8 or above 0.8 indicates a good fit. My CFI value is greater than 0.8 and TLI value is close to 0.8. RMSEA less than 0.06 or 0.08 are considered indicators of good fit. However, here, the RMSEA value is 0.218 which is greater than 0.06 or 0.08 which does not indicate a good fit. The SRMR value less than 0.1 indicates a good fit and the value of our result is 0.057. The chisq value looks comparatively high with respect to degrees of freedom. Therefore, overall the model does not a good fit.

Indicators and underlying constructs:
Based on my results and Kline's recommendations, there are indicators that are a good reflection of the underlying constructs. For example, based on Kline, if the factor loading value is greater than 0.7 then those indicators are a good reflection of the underlying constructs. Visual merchandising cues include five indicators and they are a good reflection of underlying constructs because there values are greater than 0.7. The factor loadings for telepresence and approach/avoidance behavior are very low because those values are less than 5 so that telepresence is not a good indicator for flow and approach/avoidance behavior is not a good indicator.

Factor loading value

Image quality	0.815
Interactivity.	0.811
Richness	0.920
Craftsmanship	0.766
Advertisement	0.869
Enjoyment.	0.743
Telepresence	0.265
Satisfaction	0.921
Approach	0.461

R-squared value

QL	INT	RICH	CRA	AD	EN	TEL	SAT	APP	flow	BO
0.665	0.658	0.846	0.586	0.755	0.552	0.070	0.849	0.212	NA	0.844

The r-squared value for behavioral outcomes is 0.844. It means that both flow and visual merchandising cues explain 84.4% variation in behavioral outcomes.

Interpretation of the findings:

Interpretation for all the direct paths

Based on the result, we have found that visual cues have a direct causal effect on flow and the estimate is 1.153 (standardized value). It means that each one standard deviation increase or difference in visual merchandising cues is associated with a 1.153 standard deviation predicted increase or difference in flows. Flow does not have any direct causal effect on behavioral outcomes and the value is -0.065. Visual cues have direct causal effect on behavioral outcomes

and the value is 0.994. Each one standard deviation increase or difference in visual merchandising cues is associated with a 0.994 standard deviation predicted increase or difference in behavioral outcomes. Also, there is no non causal effect.

Local misfit

The correlation residual values are given

```
    QL     INT    RICH   CRA    AD     EN     TEL    SAT    APP
QL    0.000
INT   0.089  0.000
RICH -0.077  0.004  0.000
CRA   0.014  0.048  0.011  0.000
AD    0.022 -0.038  0.015 -0.002  0.000
EN   -0.026 -0.079  0.052 -0.036  0.019  0.000
TEL   0.106 -0.162  0.039 -0.101 -0.083  0.000  0.000
SAT   0.068  0.057 -0.029 -0.001 -0.020 -0.026  0.083  0.000
APP  -0.063 -0.036 -0.007 -0.126 -0.016  0.104  0.110  0.000  0.000

$cov.z
     QL     INT    RICH   CRA    AD     EN     TEL    SAT    APP
QL    0.000
INT   3.942  0.000
RICH -8.287  0.334  0.000
CRA   0.645  2.047  0.808  0.000
AD    1.313 -2.539  1.525 -0.129  0.000
EN   -1.506 -4.921  4.571 -1.959  1.356  0.000
TEL   2.997 -4.745  1.651 -2.590 -2.834  0.000  0.000
SAT   3.612  3.155 -3.025 -0.046 -1.514 -4.671  2.835  0.000
APP  -1.852 -1.030 -0.401 -3.316 -0.579  3.907  1.879  0.000  0.00
```

From the value it is visible that there is three absolute value that is greater than 0.10 for the correlation residuals. Therefore, this value of the correlation residuals show the evidence of local misfit. However, for the standardized residuals, there are seventeen absolute values that are greater than 1.96 and that is huge. Therefore, the values of standardized residuals show the evidence of local misfit. Therefore, this model shows the local misfit.

Modification indices: We have also examined the modification indices value. The modification indices value between quality and rich is greater than 45 which might improve the overall model fit.

Appendix

All R code is given

The covariance matrix of my study is

```
    cov(visual)
```

```
             quality interactivity richness craftsman ads    enjoyment satisfaction approach telepre
quality      1.145
interactivity 0.986     1.511
richness     0.912     1.167       1.603
craftsman    1.071     1.289       1.419     2.457
ads          0.924     0.969       1.219     1.229    1.399
enjoyment    0.944     0.993       1.395     1.274    1.184   1.721
satisfaction  0.868     0.978       1.017     1.086    0.906   1.002     1.145
approach     0.396     0.496       0.635     0.408    0.547   0.816     0.596       1.722
telepre      0.459     0.127       0.489     0.252    0.261   0.312     0.448       0.383     1.459
```

```
library(lavaan)

lower= '

1.145

0.986     1.511

0.912     1.167       1.603

1.071     1.289       1.419     2.457

0.924     0.969       1.219     1.229    1.399

0.944     0.993       1.395     1.274    1.184   1.721

0.868     0.978       1.017     1.086    0.906   1.002     1.145

0.396     0.496       0.635     0.408    0.547   0.816     0.596    1.722

0.459     0.127       0.489     0.252    0.261   0.312     0.448    0.383  1.459

'


beth = getCov(lower, names=c("QL","INT","RICH","CRA","AD","EN","SAT","APP","TEL"))

print(beth)


mod= '

visualcues =~ QL +INT +RICH+CRA+AD

flow =~ EN+TEL

BO =~SAT+APP


flow~ a*visualcues
```

```
BO ~  b*visualcues + c*flow


ac := a*c



'

fit = sem(model = mod, sample.cov=beth, sample.nobs = 224)


summary(fit, fit.measures=TRUE,standardized=TRUE)

inspect(fit, what="r2")

lavResiduals(fit, type="cor")

modificationindices(fit,sort.=TRUE)



equmodone= '

visualcues =~ QL +INT +RICH+CRA+AD

flow =~ EN+TEL

BO =~SAT+APP


visualcues~ a*flow

BO ~ c*flow + b*visualcues


ab := a*b


'

equmodtwo= '

visualcues =~ QL +INT +RICH+CRA+AD

flow =~ EN+TEL

BO =~SAT+APP

flow~ a*visualcues+c*BO

visualcues ~  b*BO


ba := b*a
```

'