Scientific mapping analysis of Net Promoter Score (NPS): Supplemental Material

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This supplemental material aims to provide an open and reproducible report that shows the empirical results obtained for the paper titled: "Balancing the evidence of the Net Promoter Score: The results of a scientific mapping analysis versus an empirical work in the energy sector." A warning note is that this supplemental material is limited to the scientific mapping analysis, and does not provide any result regarding the empirical analysis of the data retrieved from the Energy sector (as this data was obtained under an anonymity agreement between the research team and the energy supplier company).

Our first step consists of using the raw data set called "NPS.RData" and apply the following series of commands

```
load("~/NPS.RData")
NPS <- data.frame(M)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
NPS <- arrange(NPS, desc(TC))
selectedPapers <- filter(NPS, grepl('REICHHELD', CR))
rm(list=setdiff(ls(), "selectedPapers"))
selectedPapers$Against <- NA
balancedPapers <- selectedPapers[, c(1, 6, 53, 37)]
```

Until this point, we now have two data sets (i.e., "balancedPapers" and "selectedPapers"). In "selectedPapers" there are 91 papers. The common attribute among them is that they all cite the paper of Reichheld (2003). In "balancedPapers" we have the same papers included in "selectedPapers", but it contains only four columns: 1) AU is the column for authors, 2) AB is the column for the abstract of each paper, 3) Against is the column that in which we are going to indicate if the paper provides specific arguments in favor or against the use of NPS (as illustrated below), and 4) TC is the column that contains the number of citations as captured by Web-of-Science database.

Classification of papers as supporters of NPS

A straightforward way to understand the literature is by differentiating the sample of articles that support the use of NPS from those that do not. Thus, we classified each paper in one of the following two categories. Articles were classified as supporters of the use of NPS if they did not provide any explicit criticism in the abstract (coded as zero); otherwise, they were classified as non-supporters of using NPS (coded as one), like this:

```
balancedPapers$Against <- c(1,0,0,1,1,1,1,0,0,1,
                            1,0,0,0,0,0,0,0,0,0,
                            0,1,0,0,0,0,0,1,0,1,
                            0,0,0,1,0,0,0,1,0,0,
                            0,0,1,0,0,0,0,0,0,0,
                            0,0,0,0,1,0,0,1,0,0,
                            0,1,0,0,1,0,0,1,0,0,
                            0,0,0,0,0,0,0,0,0,0,
                            0,0,0,0,1,0,0,0,0,0,
                            0)
```

After completing this thorough classification, we can proceed with some bibliometric analysis

Bibliometric Analysis

```
library(bibliometrix)
```

```
## To cite bibliometrix in publications, please use:
##
## Aria, M. & Cuccurullo, C. (2017) bibliometrix: An R-tool for comprehensive science mapping analysis,
##
##
## http:\\www.bibliometrix.org
##
##
## To start with the shiny web-interface, please digit:
## biblioshiny()
```

```
results <- biblioAnalysis(selectedPapers, sep = ";")

S <- summary(object = results, k = 10, pause = FALSE)
```

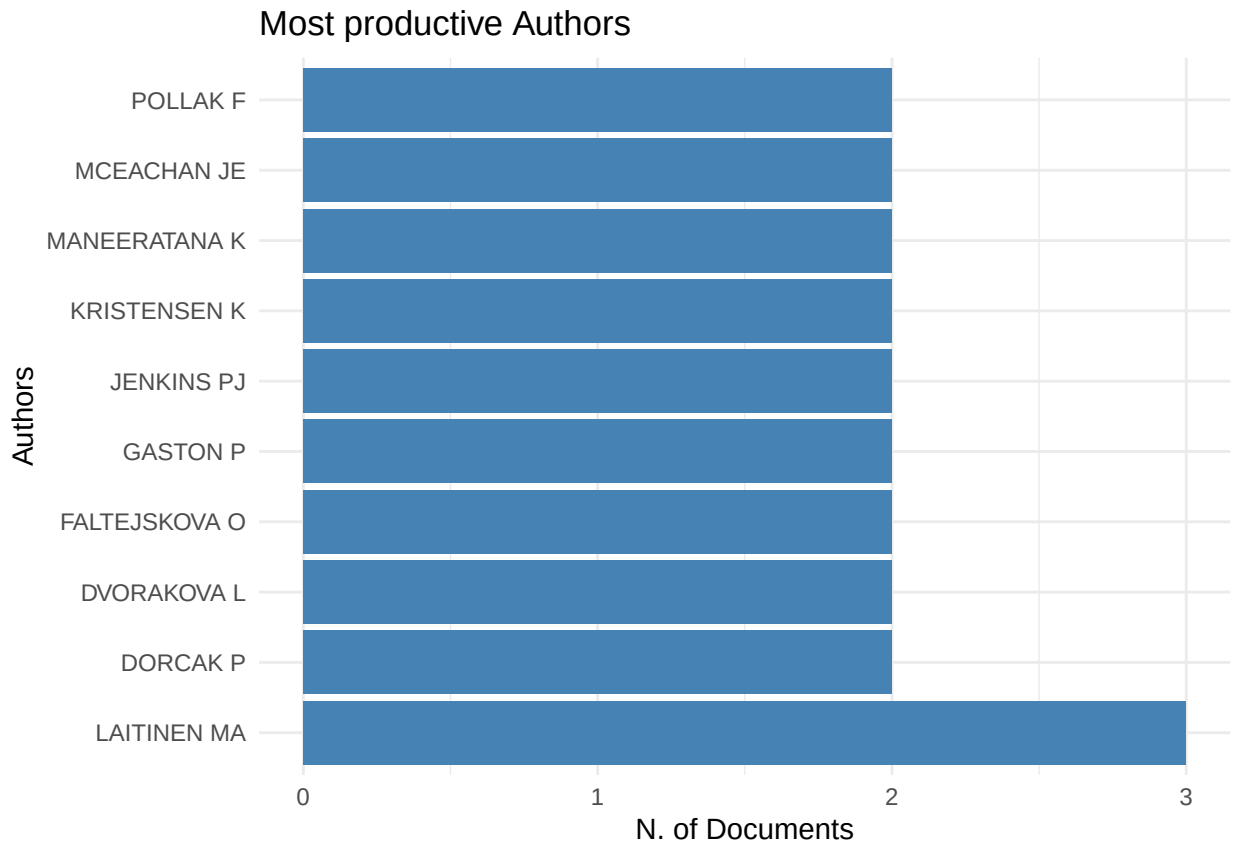
```
##
##
## MAIN INFORMATION ABOUT DATA
##
##  Timespan                             2005 : 2020
##  Sources (Journals, Books, etc)       80
##  Documents                            91
##  Average years from publication       3.58
##  Average citations per documents      5.923
```

```
##  Average citations per year per doc    1.041
##  References                            2804
##
## DOCUMENT TYPES
##  article                     66
##  article; early access       2
##  editorial material          1
##  proceedings paper           21
##  review                      1
##
## DOCUMENT CONTENTS
##  Keywords Plus (ID)                    251
##  Author's Keywords (DE)                293
##
## AUTHORS
##  Authors                               290
##  Author Appearances                    302
##  Authors of single-authored documents  11
##  Authors of multi-authored documents   279
##
## AUTHORS COLLABORATION
##  Single-authored documents             12
##  Documents per Author                  0.314
##  Authors per Document                  3.19
##  Co-Authors per Documents              3.32
##  Collaboration Index                   3.53
##
##
## Annual Scientific Production
##
##  Year    Articles
##     2005        1
##     2006        1
##     2008        2
##     2009        1
##     2011        4
##     2013        4
##     2014        6
##     2015        8
##     2016        9
##     2017       11
##     2018       14
##     2019       18
##     2020       10
##
## Annual Percentage Growth Rate 16.59144
##
##
## Most Productive Authors
##
##    Authors        Articles Authors        Articles Fractionalized
## 1   LAITINEN MA          3   LAITINEN MA                     2.50
## 2   DORCAK P             2   WANG ML                         1.33
## 3   DVORAKOVA L          2   INAL Y                          1.00
```

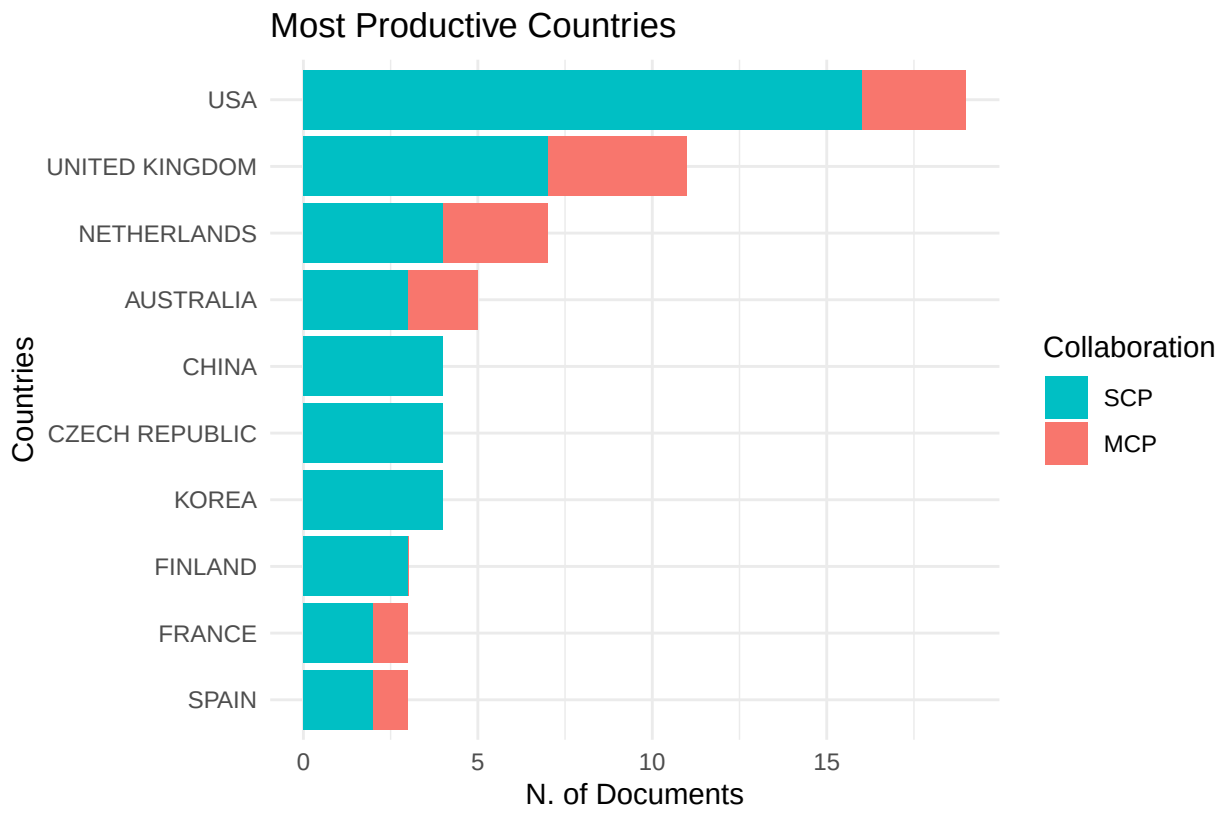
```
## 4   FALTEJSKOVA O        2   KINNEY WC                      1.00
## 5   GASTON P             2   KORNETA P                      1.00
## 6   JENKINS PJ           2   KRISTENSEN K                   1.00
## 7   KRISTENSEN K         2   LEE S                          1.00
## 8   MANEERATANA K        2   MITTAL B                       1.00
## 9   MCEACHAN JE          2   REICHHELD F                    1.00
## 10  POLLAK F             2   ROCKS B                        1.00
##
##
## Top manuscripts per citations
##
##                                  Paper           TC TCperYear
## 1  KLAUS PP, 2013, INT J MARKET RES            102     12.75
## 2  HAMILTON DF, 2014, BONE JOINT J              41      5.86
## 3  REICHHELD F, 2006, MIT SLOAN MANAGE REV      35      2.33
## 4  SPIESS J, 2014, BELL LABS TECH J             34      4.86
## 5  RANAWEERA C, 2014, J BUS RES                 30      4.29
## 6  KEININGHAM TL, 2008, MIT SLOAN MANAGE REV    30      2.31
## 7  DE HAAN E, 2015, INT J RES MARK              27      4.50
## 8  KINNEY WC, 2005, OTOLARYNGOL HEAD NECK SURG  18      1.12
## 9  MUNGER MA, 2013, J AM PHARM ASSOC            16      2.00
## 10 EAST R, 2011, INT J MARKET RES               15      1.50
##
##
## Corresponding Author's Countries
##
##           Country Articles   Freq SCP MCP MCP_Ratio
## 1  USA                  19 0.2159  16   3     0.158
## 2  UNITED KINGDOM       11 0.1250   7   4     0.364
## 3  NETHERLANDS           7 0.0795   4   3     0.429
## 4  AUSTRALIA             5 0.0568   3   2     0.400
## 5  CHINA                 4 0.0455   4   0     0.000
## 6  CZECH REPUBLIC        4 0.0455   4   0     0.000
## 7  KOREA                 4 0.0455   4   0     0.000
## 8  FINLAND               3 0.0341   3   0     0.000
## 9  FRANCE                3 0.0341   2   1     0.333
## 10 SPAIN                 3 0.0341   2   1     0.333
##
##
## SCP: Single Country Publications
##
## MCP: Multiple Country Publications
##
##
## Total Citations per Country
##
##      Country      Total Citations Average Article Citations
## 1  UNITED KINGDOM             203                    18.45
## 2  USA                        104                     5.47
## 3  NETHERLANDS                 74                    10.57
## 4  FRANCE                      41                    13.67
## 5  AUSTRALIA                   14                     2.80
## 6  KOREA                       11                     2.75
## 7  CZECH REPUBLIC              10                     2.50
```

```
## 8  CHINA                       7                     1.75
## 9  FINLAND                     5                     1.67
## 10 POLAND                      5                     2.50
##
##
## Most Relevant Sources
##
##                                                                                                                                  Sources
## 1  INTERNATIONAL JOURNAL OF MARKET RESEARCH
## 2  MIT SLOAN MANAGEMENT REVIEW
## 3  2011 INTERNATIONAL CONFERENCE ON QUALITY RELIABILITY RISK MAINTENANCE AND SAFETY ENGINEERING (ICQ
## 4  BONE \\& JOINT JOURNAL
## 5  INTERNATIONAL JOURNAL OF RESEARCH IN MARKETING
## 6  JOURNAL OF HAND SURGERY-EUROPEAN VOLUME
## 7  JOURNAL OF RETAILING AND CONSUMER SERVICES
## 8  LIBRARY MANAGEMENT
## 9  THERAPEUTIC INNOVATION \\& REGULATORY SCIENCE
## 10 2014 INTERNATIONAL CONFERENCE ON TEACHING ASSESSMENT AND LEARNING (TALE)
##
##
## Most Relevant Keywords
##
##    Author Keywords (DE)      Articles Keywords-Plus (ID)     Articles
## 1   NET PROMOTER SCORE             26  SATISFACTION                19
## 2   NPS                            12  LOYALTY                     13
## 3   CUSTOMER SATISFACTION           9  CARE                         7
## 4   SATISFACTION                    9  CUSTOMER SATISFACTION        6
## 5   CUSTOMER LOYALTY                8  IMPACT                       6
## 6   NET PROMOTER SCORE (NPS)        6  NEED                         6
## 7   LOYALTY                         5  QUALITY                      6
## 8   NET PROMOTER                    4  INFORMATION                  5
## 9   CUSTOMER EXPERIENCE             3  INTENTIONS                   5
## 10  IMPACT ASSESSMENT               3  NET PROMOTER                 5
```

```r
plot(x = results, k = 10, pause = FALSE)
```

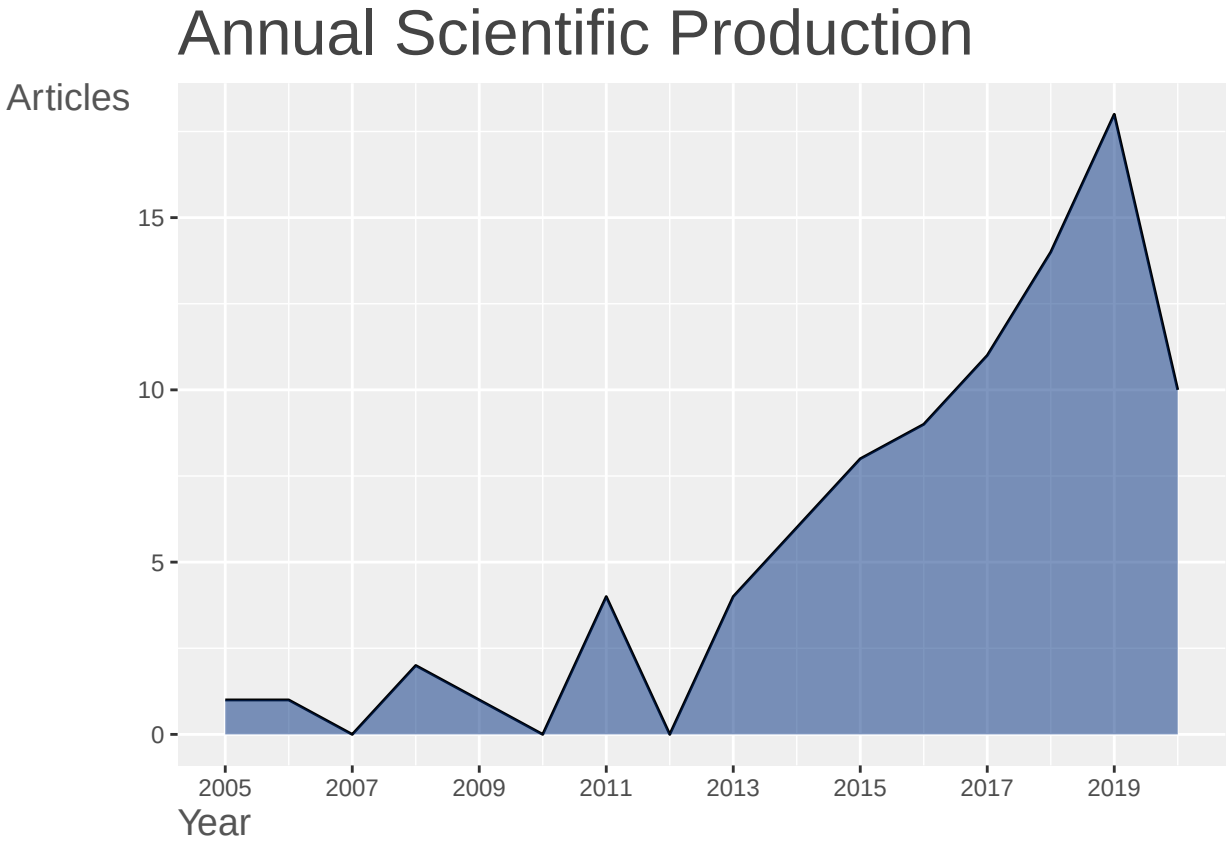



```
## Warning: Use of ‘xx$Country‘ is discouraged. Use ‘Country‘ instead.

## Warning: Use of ‘xx$Freq‘ is discouraged. Use ‘Freq‘ instead.

## Warning: Use of ‘xx$Collaboration‘ is discouraged. Use ‘Collaboration‘ instead.
```

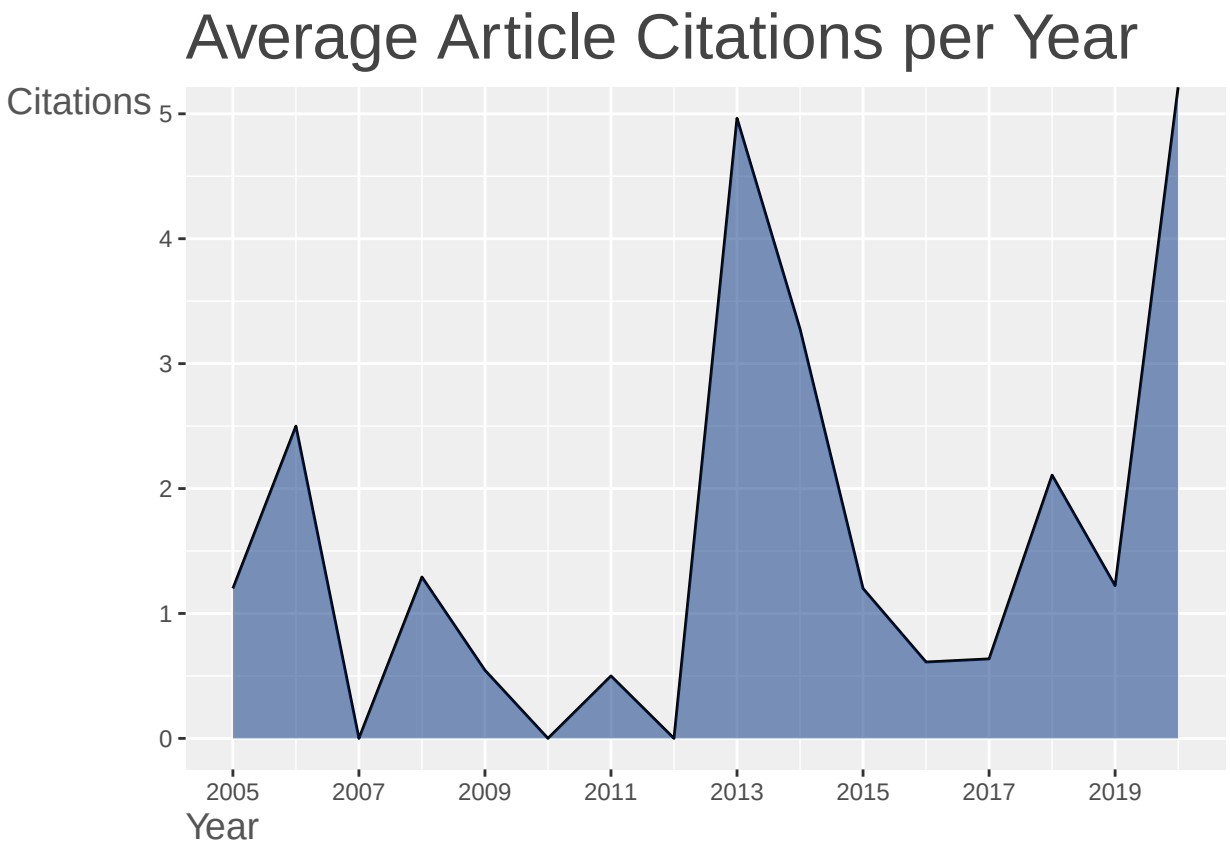


SCP: Single Country Publications, MCP: Multiple Country Publications

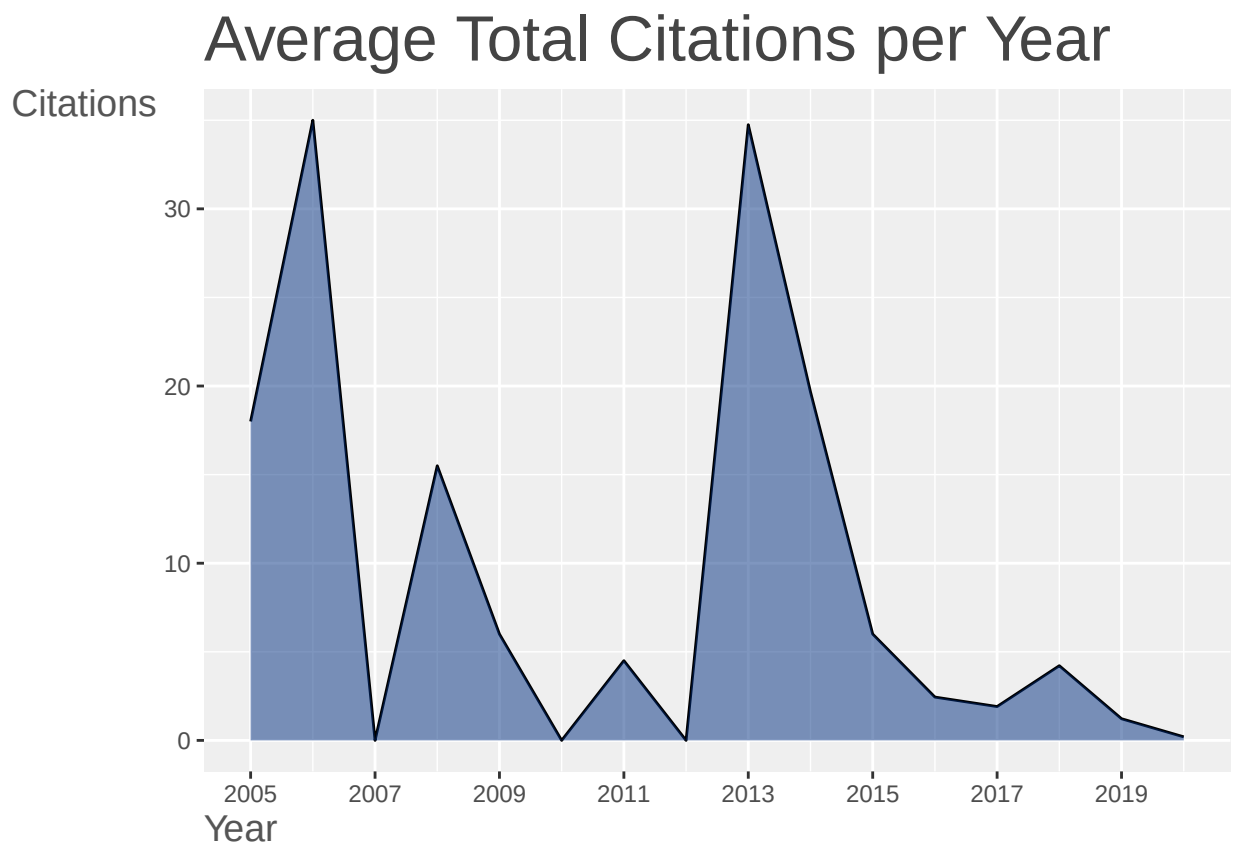
```
## Warning: Use of `Y$Year` is discouraged. Use `Year` instead.

## Warning: Use of `Y$Freq` is discouraged. Use `Freq` instead.

## Warning: Use of `Y$Year` is discouraged. Use `Year` instead.

## Warning: Use of `Y$Freq` is discouraged. Use `Freq` instead.
```




```
## Warning: Use of ‘Table2$Year‘ is discouraged. Use ‘Year‘ instead.

## Warning: Use of ‘Table2$MeanTCperYear‘ is discouraged. Use ‘MeanTCperYear‘ instead.

## Warning: Use of ‘Table2$Year‘ is discouraged. Use ‘Year‘ instead.

## Warning: Use of ‘Table2$MeanTCperYear‘ is discouraged. Use ‘MeanTCperYear‘ instead.
```

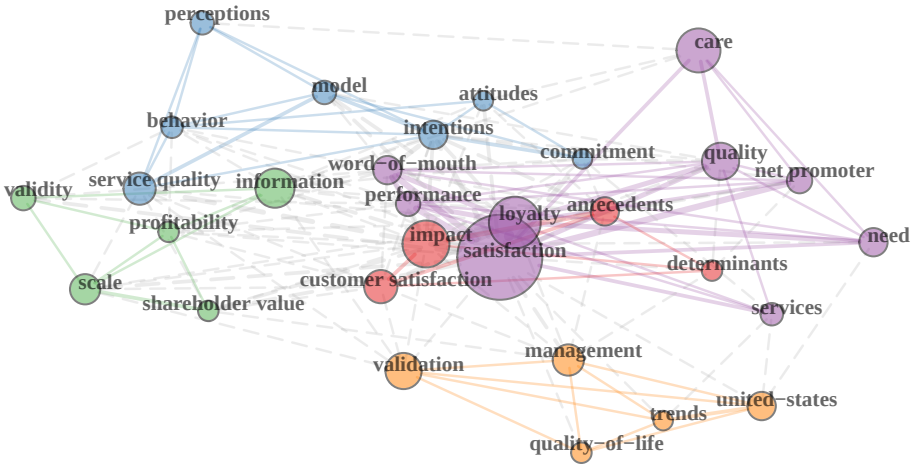



```
## Warning: Use of ‘Table2$Year‘ is discouraged. Use ‘Year‘ instead.

## Warning: Use of ‘Table2$MeanTCperArt‘ is discouraged. Use ‘MeanTCperArt‘ instead.

## Warning: Use of ‘Table2$Year‘ is discouraged. Use ‘Year‘ instead.

## Warning: Use of ‘Table2$MeanTCperArt‘ is discouraged. Use ‘MeanTCperArt‘ instead.
```

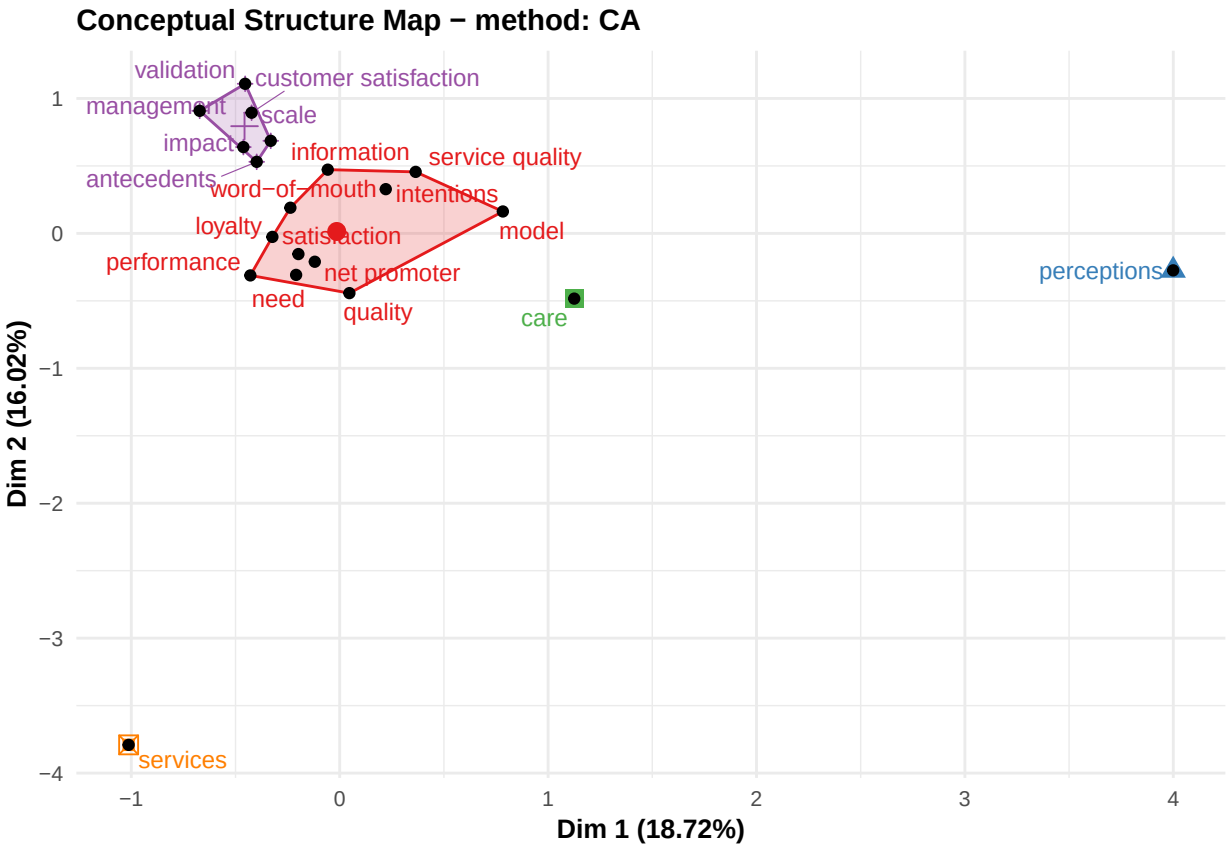


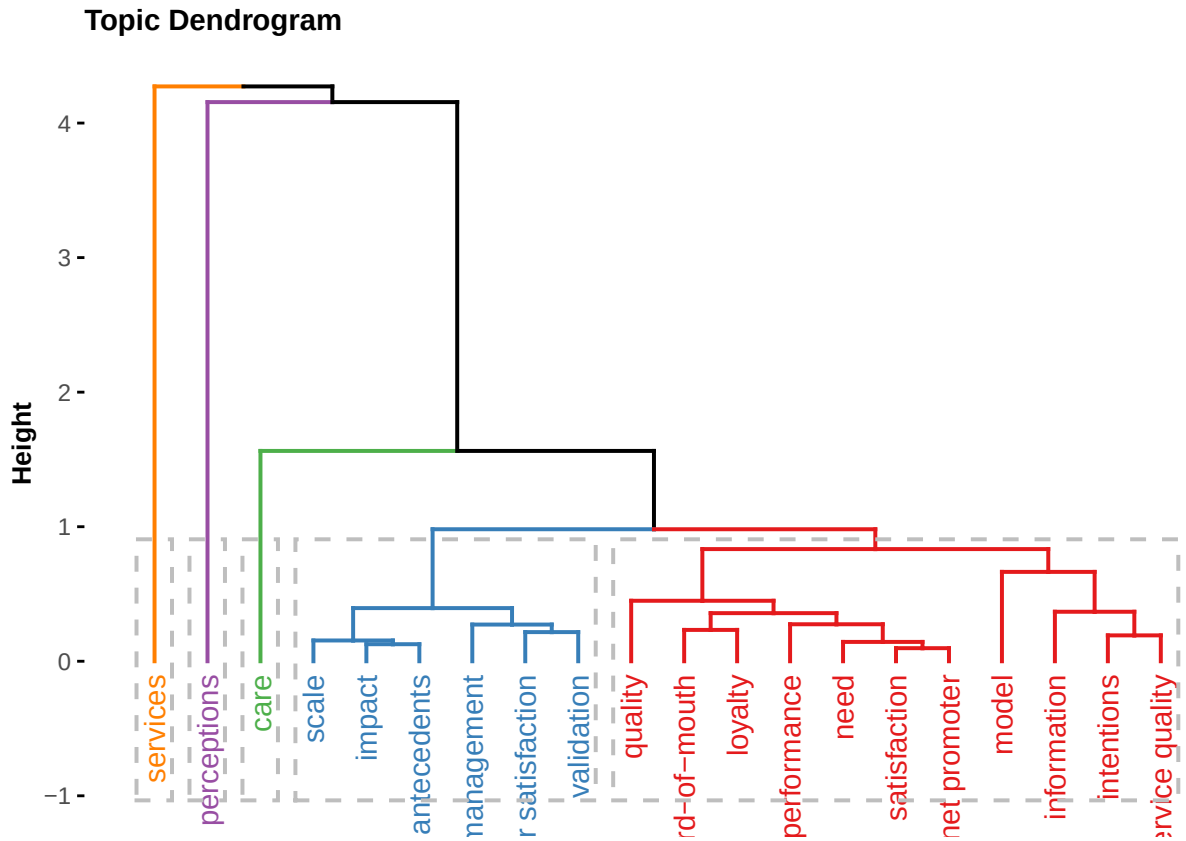

```
NetMatrix <- biblioNetwork(selectedPapers,
                           analysis = "co-occurrences",
                           network = "keywords",
                           sep = ";")

net=networkPlot(NetMatrix,
                normalize="association",
                weighted=T, n = 30,
                Title = "Keyword Co-occurrences",
                type = "fruchterman",
                size=T,
                edgesize = 5,
                labelsize=0.7)
```

Keyword Co−occurrences

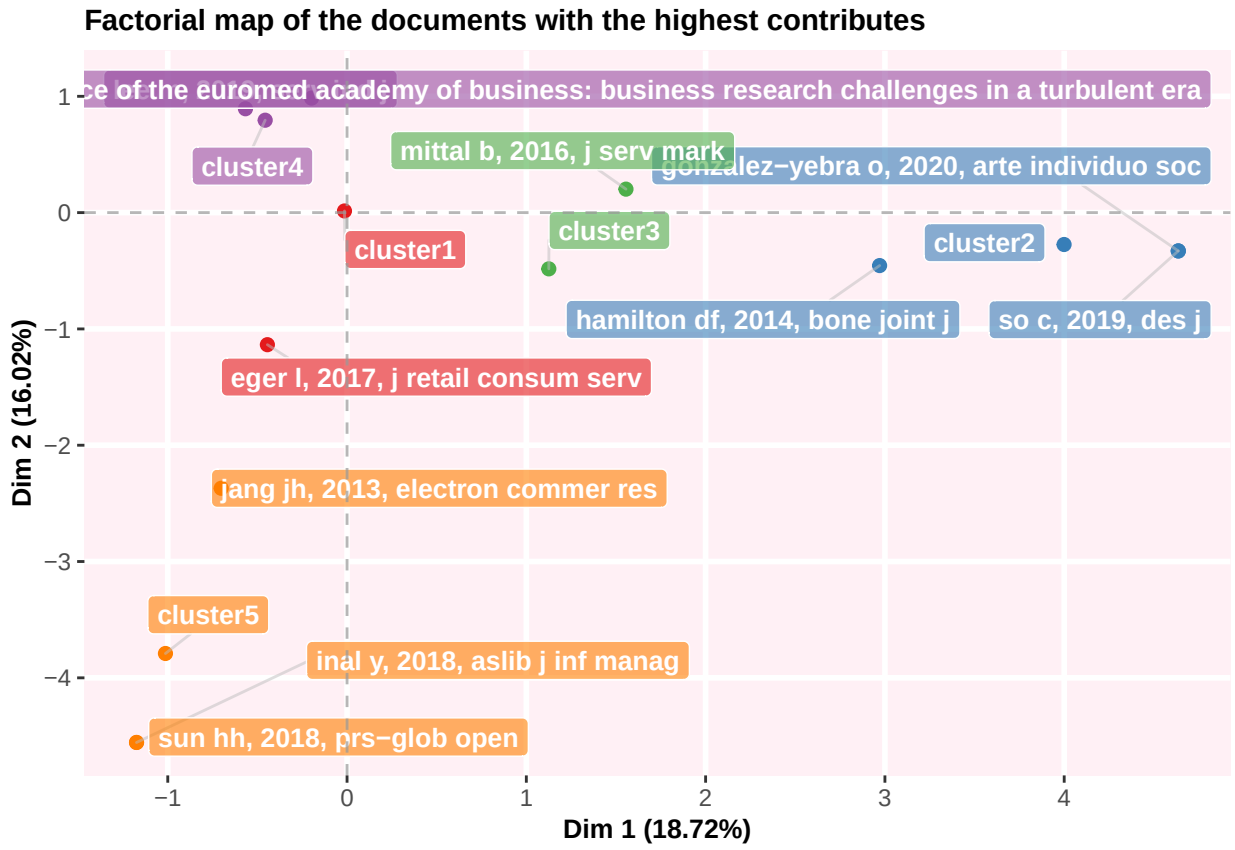



```
CS <- conceptualStructure(selectedPapers,
                          field="ID",
                          method="CA",
                          minDegree=4,
                          clust=5,
                          stemming=FALSE,
                          labelsize=10,
                          documents=10)
```

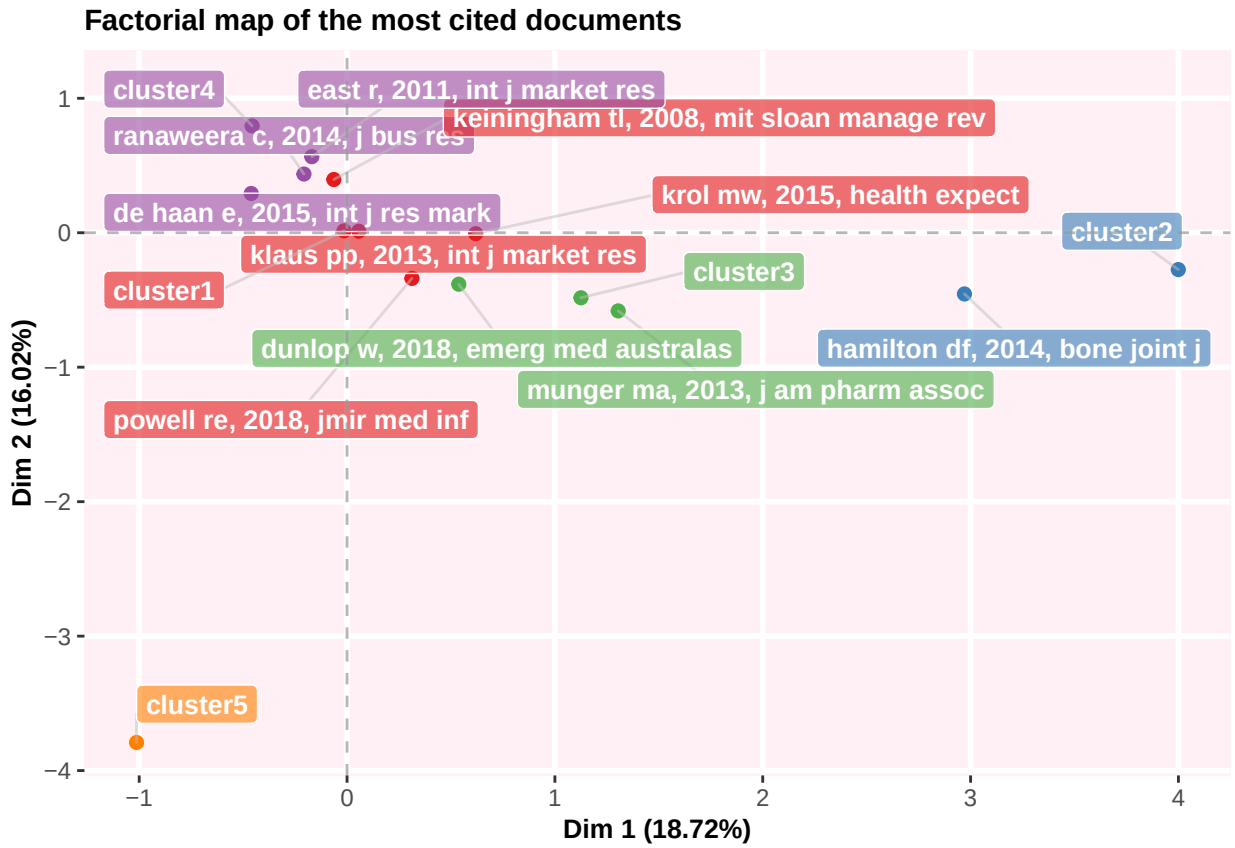

Conceptual Structure Map − method: CA
validation
customer satisfaction
management
scale
impact
information
service quality
antecedents
word−of−mouth
intentions
loyalty
satisfaction
model
performance
net promoter
need
quality
care
perceptions
services
Dim 2 (16.02%)
Dim 1 (18.72%)
1
0
−1
−2
−3
−4
−1
0
1
2
3
4




```
## Warning: Use of ‘A$dim1‘ is discouraged. Use ‘dim1‘ instead.

## Warning: Use of ‘A$dim2‘ is discouraged. Use ‘dim2‘ instead.

## Warning: Use of ‘A$nomi‘ is discouraged. Use ‘nomi‘ instead.

## Warning: Use of ‘A$dim1‘ is discouraged. Use ‘dim1‘ instead.

## Warning: Use of ‘A$dim2‘ is discouraged. Use ‘dim2‘ instead.

## Warning: Use of ‘A$nomi‘ is discouraged. Use ‘nomi‘ instead.
```

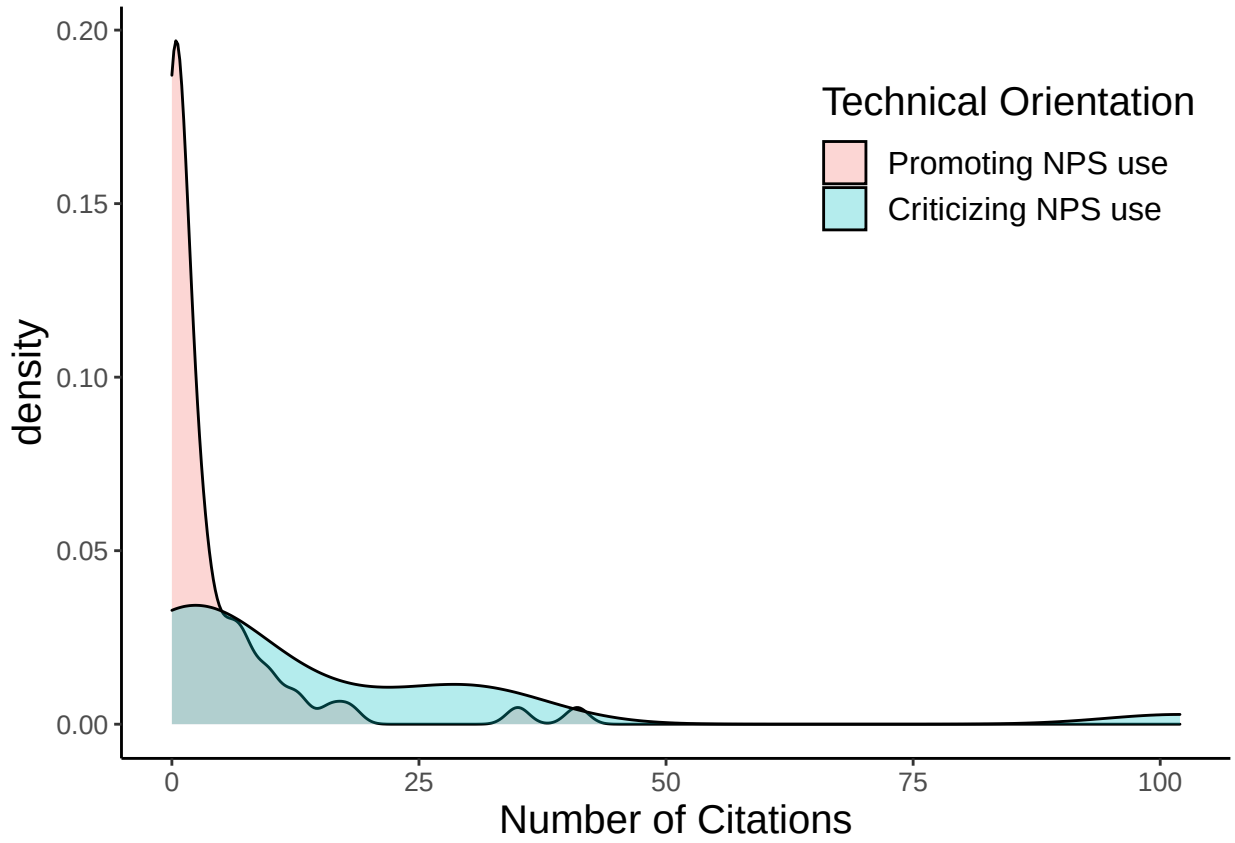



```
## Warning: Use of ‘B$dim1‘ is discouraged. Use ‘dim1‘ instead.

## Warning: Use of ‘B$dim2‘ is discouraged. Use ‘dim2‘ instead.

## Warning: Use of ‘B$nomi‘ is discouraged. Use ‘nomi‘ instead.

## Warning: Use of ‘B$dim1‘ is discouraged. Use ‘dim1‘ instead.

## Warning: Use of ‘B$dim2‘ is discouraged. Use ‘dim2‘ instead.

## Warning: Use of ‘B$nomi‘ is discouraged. Use ‘nomi‘ instead.
```



The structure of keywords co-occurrence network is depicted. This network resulted from using the keywords that appeared in each paper analyzed. The size of each node is proportional to the frequency of appearance of each word in the list of keywords extracted from the bibliometric sample. Straight lines that connect pairs of nodes represent the frequency any couple of keywords occurred at the same time across the papers analyzed. Another interesting result is the organization of topics illustrated as a clustered topics dendrogram. In this plot, topics are arranged as individual branches whose similarity was calculated as the Euclidean distance between the vectors that represent the set of keywords appearing in each paper.

```
library(ggplot2)
p <- ggplot(balancedPapers,
            aes(x=TC, fill=as.character(Against))) + geom_density(alpha=0.3) + theme_classic() +
xlab("Number of Citations") +
theme(text = element_text(size=15),
      axis.text.x = element_text(size = 10),
      axis.text.y = element_text(size = 10))

        p + theme(legend.position=c(x=0.8, y=0.8)) +
scale_fill_discrete(name = "Technical Orientation", labels = c("Promoting NPS use", "Criticizing NPS us
```



In this last Figure, it can be seen the statistical distribution of citations for both the papers that promote the use of NPS for practical purposes and those that criticize it. It can be seen that papers that provide critical arguments against the use of NPS for practical purposes tend to be more cited than those documents that promote the use of NPS without precautions.