Package 'AHPhybrid'

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Type Package

Title AHP Hybrid Method

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Description The AHP method (Analytic Hierarchy Process) is a multi-criteria decision-
making method addressing
choice and outranking problems. The method enables to perform the analysis of alterna-
tives in each
type of criterion and then provides a global performance of each alternative in the decision context.
The main difference of this package is the possibility of evaluating the alternatives using quanti-
tative
data, by numerical representation, and qualitative data, using the Saaty scale, providing preference
relation between variables by a pairwise evaluation.

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Contents

AHPhybrid	*AHP Hybrid*

Description

The AHP method (Analytic Hierarchy Process) is a multi-criteria decision-making method addressing choice and outranking problems. The method enables to perform the analysis of alternatives in each type of criterion and then provides a global performance of each alternative in the decision context. The main difference of this package is the possibility of evaluating the alternatives using quantitative data, by numerical representation, and qualitative data, using the Saaty scale, providing preference relation between variables by a pairwise evaluation.

Usage

```
 AHPhybrid(title, Alternatives, Qualitative_criteria, Quantitative_criteria,
Quantitative_crit_min_max, n_alt, n_crit, n_crit_Qual, n_crit_Quant, Criteria_Comparison,
Alternatives_comparison_qualit_crit, Alternatives_quantitative_crit)
```

Arguments

title	Title of analysis.
Alternatives	Name of alternatives in analysis.
Qualitative_criteria	
	Name of criteria with qualitative performance.
Quantitative_criteria	
	Name of criteria with quantitative performance.
Quantitative_crit_min_max	
	A vector with objectives, minimize or maximize, to each criteria.
n_alt	number of alternatives (It is not necessary to make any input).
n_crit	number of criteria (It is not necessary to make any input).
n_crit_Qual	number of qualitative criteria (It is not necessary to make any input).
n_crit_Quant	number of quantitative criteria (It is not necessary to make any input).
Criteria_Comparison	
	Input of matrix comparison with the preferences relations between the criteria.
Alternatives_comparison_qualit_crit	
	Input of matrix comparison with the preferences relations between the alternatives in each qualitative criterion.
Alternatives_quantitative_crit	
	Input of quantitative performance of alternatives in each quantitative criterion.

Value

- Calculation of criteria priorities;

- Calculation of alternatives priorities in each criterion and in a global context.

- Validadtion of prefernce inputs by the consistency index;

- Provide the analysis considering qunatitative and qualitative data.

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References

GOLDEN, Bruce L.; WASIL, Edward A.; HARKER, Patrick T. The analytic hierarchy process.
Applications and Studies, Berlin, Heidelberg, 1989. <https://link.springer.com/book/10.1007

Examples

```
title <- "Layout Manufacturing Analysis"

Alternatives <- c("Layout_A", "Layout_B")

Qualitative_criteria <- c("Material  Handling","Process Quality" )

Quantitative_criteria <- c("Cost", "Production", "Cost Reduction")

Quantitative_crit_min_max <- c("min","max", "max")

n_alt <- length(Alternatives)
n_crit <- (length(Qualitative_criteria)+length(Quantitative_criteria))
n_crit_Qual <- length(Qualitative_criteria)
n_crit_Quant <- length(Quantitative_criteria)


Criteria_Comparison <- matrix(c(1, 1/5,   1, 1/7, 1/2,
                                5,   1,   3,   1,   2,
                                1, 1/3,   1, 1/4, 1/2,
                                7,   1,   4,   1,   2,
                                2, 1/2,   2, 1/2,   1),

                                ncol = n_crit, nrow = n_crit, byrow = TRUE)


Alternatives_comparison_qualit_crit <- list(

                                    matrix(c(  1,   5,
                                             1/5,   1),

                                       ncol = n_alt, nrow = n_alt, byrow = TRUE),

                                    matrix(c(  1, 1/3,
                                               3,   1),

                                       ncol = n_alt, nrow = n_alt, byrow = TRUE)

                                    )

Alternatives_quantitative_crit <- matrix(c(200000, 17389, 420000,
                                           300000, 28257, 360000),
```

```
                                          nrow = n_alt, ncol = n_crit_Quant, byrow = TRUE)
```

```
AHPhybrid(title, Alternatives, Qualitative_criteria, Quantitative_criteria,
Quantitative_crit_min_max, n_alt, n_crit, n_crit_Qual, n_crit_Quant, Criteria_Comparison,
Alternatives_comparison_qualit_crit, Alternatives_quantitative_crit)
```

Index

AHPhybrid,