

# Package: xxdi (via r-universe)

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**Type** Package

**Title** Calculate Expertise Indices

**Version** 1.2.3

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**Description** Institutional performance assessment remains a key challenge to a multitude of stakeholders. Existing indicators such as h-type indicators, g-type indicators, and many others do not reflect expertise of institutions that defines their research portfolio. The package offers functionality to compute and visualise two novel indices: the x-index and the xd-index. The x-index evaluates an institution's scholarly expertise within a specific discipline or field, while the xd-index provides a broader assessment of overall scholarly expertise considering an institution's publication pattern and strengths across coarse thematic areas. These indices offer a nuanced understanding of institutional research capabilities, aiding stakeholders in research management and resource allocation decisions. Lathabai, H.H., Nandy, A., and Singh, V.K. (2021) <doi:10.1007/s11192-021-04188-3>. Nandy, A., Lathabai, H.H., and Singh, V.K. (2023) <doi:10.5281/zenodo.8305585>.

**License** GPL-3

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g_index	<i>g_index</i>
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### Description

This function calculates the g-index for an institution using bibliometric data from an edge list, with an optional plot visualisation.

### Usage

```
g_index(df, id = NULL, cit, plot = FALSE)
```

### Arguments

<code>df</code>	Data frame object containing bibliometric data. This data frame must have at least three columns: one for keywords, one for unique IDs, and one for citation counts. Each row in the data frame should represent a document or publication.
<code>id</code>	Character string specifying the name of the column in "df" that contains unique identifiers for each document. Each cell in this column must contain a single ID (unless missing) and not multiple IDs. Only required when 'plot' parameter is set to "TRUE". Default set to NULL.
<code>cit</code>	Character string specifying the name of the column in "df" that contains the number of citations each document has received. Citations must be represented as integers. Each cell in this column should contain a single integer value (unless missing) representing the citation count for the corresponding document.
<code>plot</code>	Logical value indicating whether to generate and display a plot of the g-index calculation. Set to "TRUE" or "T" to generate the plot, and "FALSE" or "F" to skip plot generation. The default is "FALSE".

### Value

g-index value and plot for institution.

**Examples**

```

# Create an example data frame
dat1 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a; b; c", "b; d", "c", "d", "e; g", "f", "g"),
  id = c("abc123", "bcd234", "def345", "efg456", "fgh567", "ghi678", "hij789"),
  categories = c("a; d; e", "b", "c", "d; g", "e", "f", "g"))
# Calculate g-index
g_index(df = dat1, cit = "citations")

# Create another example data frame
dat2 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a/ b/ c", "b/ d", "c", "d", "e/ g", "f", "g"),
  id = c("123", "234", "345", "456", "567", "678", "789"),
  categories = c("a/ d/ e", "b", "c", "d/ g", "e", "f", "g"))
# Calculate g-index
g_index(df = dat2, id = "id", cit = "citations", plot = FALSE)

# Create another example data frame
dat3 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a, b, c", "b, d", "c", "d", "e, g", "f", "g"),
  id = c(123, 234, 345, 456, 567, 678, 789),
  categories = c("a: d: e", "b", "c", "d: g", "e", "f", "g"))
# Calculate g-index and produce plot
g_index(df = dat3, id = "id", cit = "citations", plot = TRUE)

```

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*h\_index**h\_index*

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**Description**

This function calculates the h-index for an institution using bibliometric data from an edge list, with an optional plot visualisation.

**Usage**

```
h_index(df, id = NULL, cit, plot = FALSE)
```

**Arguments**

df	Data frame object containing bibliometric data. This data frame must have at least three columns: one for keywords, one for unique IDs, and one for citation counts. Each row in the data frame should represent a document or publication.
id	Character string specifying the name of the column in "df" that contains unique identifiers for each document. Each cell in this column must contain a single ID (unless missing) and not multiple IDs. Only required when 'plot' parameter is set to "TRUE". Default set to NULL.

cit	Character string specifying the name of the column in "df" that contains the number of citations each document has received. Citations must be represented as integers. Each cell in this column should contain a single integer value (unless missing) representing the citation count for the corresponding document.
plot	Logical value indicating whether to generate and display a plot of the h-index calculation. Set to "TRUE" or "T" to generate the plot, and "FALSE" or "F" to skip plot generation. The default is "FALSE".

### Value

h-index value and plot for institution.

### Examples

```
# Create an example data frame
dat1 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a; b; c", "b; d", "c", "d", "e; g", "f", "g"),
  id = c("abc123", "bcd234", "def345", "efg456", "fgh567", "ghi678", "hij789"),
  categories = c("a; d; e", "b", "c", "d; g", "e", "f", "g"))
# Calculate h-index
h_index(df = dat1, cit = "citations")

# Create another example data frame
dat2 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a/ b/ c", "b/ d", "c", "d", "e/ g", "f", "g"),
  id = c("123", "234", "345", "456", "567", "678", "789"),
  categories = c("a/ d/ e", "b", "c", "d/ g", "e", "f", "g"))
# Calculate h-index
h_index(df = dat2, id = "id", cit = "citations", plot = FALSE)

# Create another example data frame
dat3 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a, b, c", "b, d", "c", "d", "e, g", "f", "g"),
  id = c(123, 234, 345, 456, 567, 678, 789),
  categories = c("a: d: e", "b", "c", "d: g", "e", "f", "g"))
# Calculate h-index and produce plot
h_index(df = dat3, id = "id", cit = "citations", plot = TRUE)
```

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xc\_index

*xc\_index*

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### Description

This is a standalone function that specifically calculates the xc-index for an institution using bibliometric data from an edge list, with an optional plot visualisation. The function is suitable for including inside loops when plotting parameter is set to "FALSE" or "F".

**Usage**

```
xc_index(
  df,
  kw,
  cat,
  id,
  cit,
  type = "h",
  kdml = ";",
  cdml = ";",
  plot = FALSE
)
```

**Arguments**

<code>df</code>	Data frame object containing bibliometric data. This data frame must have at least three columns: one for keywords, one for unique IDs, and one for citation counts. Each row in the data frame should represent a document or publication.
<code>kw</code>	Character string specifying the name of the column in "df" that contains keywords. Each cell in this column may contain no keywords (missing), a single keyword or multiple keywords separated by a specified delimiter.
<code>cat</code>	Character string specifying the name of the column in "df" that contains categories. Each cell in this column may contain no categories (missing), a single category or multiple categories separated by a specified delimiter.
<code>id</code>	Character string specifying the name of the column in "df" that contains unique identifiers for each document. Each cell in this column must contain a single ID (unless missing) and not multiple IDs.
<code>cit</code>	Character string specifying the name of the column in "df" that contains the number of citations each document has received. Citations must be represented as integers. Each cell in this column should contain a single integer value (unless missing) representing the citation count for the corresponding document.
<code>type</code>	"h" for Hirsch's h-type index or "g" for Egghe's g-type index. Default set to "h".
<code>kdml</code>	Character string specifying the delimiter used in the "kw" column to separate multiple keywords within a single cell. The delimiter should be consistent across the entire "kw" column. Common delimiters include ";", "/", ":", and ",". The default delimiter is set to ";".
<code>cdml</code>	Character string specifying the delimiter used in the "cat" column to separate multiple categories within a single cell. The delimiter should be consistent across the entire "cat" column. Common delimiters include ";", "/", ":", and ",". The default delimiter is set to ";".
<code>plot</code>	Logical value indicating whether to generate and display a plot of the xc-index calculation. Set to "TRUE" or "T" to generate the plot, and "FALSE" or "F" to skip plot generation. The default is "FALSE".

**Value**

xc-index value and plot for institution.

## Examples

```
# Create an example data frame
dat <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
                 keywords = c("a; b; c", "b; d", "c", "d", "e; g", "f", "g"),
                 id = c("abc123", "bcd234", "def345", "efg456", "fgh567", "ghi678", "hij789"),
                 categories = c("a; d; e", "b", "c", "d; g", "e", "f", "g"))
# Calculate g-type xc-index
xc_index(df = dat, kw = "keywords", cat = "categories", id = "id", cit = "citations", type = "g")
# Calculate h-type xc-index and produce plot
xc_index(df = dat, kw = "keywords", cat = "categories", id = "id", cit = "citations", plot = TRUE)
```

---

xdc\_index

*xdc\_index*


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## Description

This is a general function that calculates the x-index, xd-index, and xc-index for an institution using bibliometric data from an edge list. Returns the x-index or the xd-index depending on the input vector in "p1". Returns x-index when "p1" is the dataframe column containing keywords and xd-index when "p1" the dataframe column containing categories. Returns a summary table listing x-index, xd-index, and xc-index when both "p1" and "p2" are supplied. In this case, "p2" must be the higher level, i.e., categories and "p1" must be the lower level, i.e., keywords. The function is suitable for including inside loops when only one input vector is provided. However, for looping xc-index, a separate 'xc\_index' function is provided which also includes an option to produce plots. Similarly, 'x\_index' and 'xd\_index' are standalone functions for calculating x-index and xd-index respectively as well as producing plots.

## Usage

```
xdc_index(df, p1, p2 = NULL, id, cit, dlm1 = ";", dlm2 = ";", hg = FALSE)
```

## Arguments

- |    |   |
|----|---|
| df | Data frame object containing bibliometric data. This data frame must have at least three columns: one for keywords/categories, one for unique IDs, and one for citation counts. Each row in the data frame should represent a document or publication.  |
| p1 | Character string specifying the name of the column in "df" that contains the first parameter of interest. Generally, this will be a column for keywords/categories. Each cell in this column may contain no keywords/categories (missing), a single keyword/category or multiple keywords/categories separated by a specified delimiter. Input the column for keywords to calculate the x-index, and the column for categories to calculate the xd-index. |
| p2 | Character string specifying the name of the column in "df" that contains the second parameter of interest. This is an optional parameter only required when calculating xc-index. When an input is provided, it is expected that "p1" is the  |

	lower level, generally keywords, and "p2" is the higher level, generally categories. Each cell in this column may contain no categories (missing), a single category or multiple categories separated by a specified delimiter. The default is set to "NULL".
id	Character string specifying the name of the column in "df" that contains unique identifiers for each document. Each cell in this column must contain a single ID (unless missing) and not multiple IDs.
cit	Character string specifying the name of the column in "df" that contains the number of citations each document has received. Citations must be represented as integers. Each cell in this column should contain a single integer value (unless missing) representing the citation count for the corresponding document.
d1m1	Character string specifying the delimiter used in the "p1" column to separate multiple keywords/categories within a single cell. The delimiter should be consistent across the entire "p1" column. Common delimiters include ";", "/", ":", and ",". The default delimiter is set to ";".
d1m2	Character string specifying the delimiter used in the "p2" column to separate multiple categories within a single cell. The delimiter should be consistent across the entire "p2" column. Common delimiters include ";", "/", ":", and ",". The default delimiter is set to ";".
hg	Logical value indicating whether to compute Hirsch's h- and Egghe's g-indices. Default set to "FALSE".

### Value

x-index value, and/or xd-index value, and/or xc-index value for institution.

### Examples

```
# Create an example data frame
dat1 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a; b; c", "b; d", "c", "d", "e; g", "f", "g"),
  id = c("abc123", "bcd234", "def345", "efg456", "fgh567", "ghi678", "hij789"),
  categories = c("a; d; e", "b", "c", "d; g", "e", "f", "g"))
# Calculate x-index
xdc_index(df = dat1, p1 = "keywords", id = "id", cit = "citations")
# Calculate xd-index
xdc_index(df = dat1, p1 = "categories", id = "id", cit = "citations", hg = TRUE)
# Calculate x-index, xd-index, and xc-index together
xdc_index(df = dat1, p1 = "keywords", p2 = "categories", id = "id", cit = "citations", hg = TRUE)
```

---

xd\_index

*xd\_index*

---

### Description

This is a standalone function that specifically calculates the xd-index for an institution using bibliometric data from an edge list, with an optional plot visualisation. The function is suitable for including inside loops when plotting parameter is set to "FALSE" or "F".

**Usage**

```
xd_index(df, cat, id, cit, type = "h", dlm = ";", plot = FALSE)
```

**Arguments**

<code>df</code>	Data frame object containing bibliometric data. This data frame must have at least three columns: one for categories, one for unique IDs, and one for citation counts. Each row in the data frame should represent a document or publication.
<code>cat</code>	Character string specifying the name of the column in "df" that contains categories. Each cell in this column may contain no categories (missing), a single category or multiple categories separated by a specified delimiter.
<code>id</code>	Character string specifying the name of the column in "df" that contains unique identifiers for each document. Each cell in this column must contain a single ID (unless missing) and not multiple IDs.
<code>cit</code>	Character string specifying the name of the column in "df" that contains the number of citations each document has received. Citations must be represented as integers. Each cell in this column should contain a single integer value (unless missing) representing the citation count for the corresponding document.
<code>type</code>	"h" for Hirsch's h-type index or "g" for Egghe's g-type index. Default set to "h".
<code>dlm</code>	Character string specifying the delimiter used in the "cat" column to separate multiple categories within a single cell. The delimiter should be consistent across the entire "cat" column. Common delimiters include ";", "/", ":", and ",". The default delimiter is set to ";".
<code>plot</code>	Logical value indicating whether to generate and display a plot of the xd-index calculation. Set to "TRUE" or "T" to generate the plot, and "FALSE" or "F" to skip plot generation. The default is "FALSE".

**Value**

xd-index value and plot for institution.

**Examples**

```
# Create an example data frame
dat1 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a; b; c", "b; d", "c", "d", "e; g", "f", "g"),
  id = c("abc123", "bcd234", "def345", "efg456", "fgh567", "ghi678", "hij789"),
  categories = c("a; d; e", "b", "c", "d; g", "e", "f", "g"))

# Calculate h-type xd-index
xd_index(df = dat1, cat = "categories", id = "id", cit = "citations")

# Create another example data frame
dat2 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
  keywords = c("a/ b/ c", "b/ d", "c", "d", "e/ g", "f", "g"),
  id = c("123", "234", "345", "456", "567", "678", "789"),
  categories = c("a/ d/ e", "b", "c", "d/ g", "e", "f", "g"))

# Calculate g-type xd-index
xd_index(df = dat2, cat = "categories", id = "id", cit = "citations", type = "g", dlm = "/")
```



```
# Create another example data frame
dat3 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
                  keywords = c("a, b, c", "b, d", "c", "d", "e, g", "f", "g"),
                  id = c(123, 234, 345, 456, 567, 678, 789),
                  categories = c("a: d: e", "b", "c", "d: g", "e", "f", "g"))
# Calculate h-type x-index and produce plot
xd_index(df = dat3, cat = "categories", id = "id", cit = "citations", dlm = ":", plot = TRUE)
```

---

x\_index

*x\_index*


---

## Description

This is a standalone function that specifically calculates the x-index for an institution using bibliometric data from an edge list, with an optional plot visualisation. The function is suitable for including inside loops when plotting parameter is set to "FALSE" or "F".

## Usage

```
x_index(df, kw, id, cit, type = "h", dlm = ";", plot = FALSE)
```

## Arguments

df	Data frame object containing bibliometric data. This data frame must have at least three columns: one for keywords, one for unique IDs, and one for citation counts. Each row in the data frame should represent a document or publication.
kw	Character string specifying the name of the column in "df" that contains keywords. Each cell in this column may contain no keywords (missing), a single keyword or multiple keywords separated by a specified delimiter.
id	Character string specifying the name of the column in "df" that contains unique identifiers for each document. Each cell in this column must contain a single ID (unless missing) and not multiple IDs.
cit	Character string specifying the name of the column in "df" that contains the number of citations each document has received. Citations must be represented as integers. Each cell in this column should contain a single integer value (unless missing) representing the citation count for the corresponding document.
type	"h" for Hirsch's h-type index or "g" for Egghe's g-type index. Default set to "h".
dlm	Character string specifying the delimiter used in the "kw" column to separate multiple keywords within a single cell. The delimiter should be consistent across the entire "kw" column. Common delimiters include ";", "/", ":", and ",". The default delimiter is set to ";".
plot	Logical value indicating whether to generate and display a plot of the x-index calculation. Set to "TRUE" or "T" to generate the plot, and "FALSE" or "F" to skip plot generation. The default is "FALSE".

**Value**

x-index value and plot for institution.

**Examples**

```
# Create an example data frame
dat1 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
                  keywords = c("a; b; c", "b; d", "c", "d", "e; g", "f", "g"),
                  id = c("abc123", "bcd234", "def345", "efg456", "fgh567", "ghi678", "hij789"),
                  categories = c("a; d; e", "b", "c", "d; g", "e", "f", "g"))
# Calculate h-type x-index
x_index(df = dat1, kw = "keywords", id = "id", cit = "citations")

# Create another example data frame
dat2 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
                  keywords = c("a/ b/ c", "b/ d", "c", "d", "e/ g", "f", "g"),
                  id = c("123", "234", "345", "456", "567", "678", "789"),
                  categories = c("a/ d/ e", "b", "c", "d/ g", "e", "f", "g"))
# Calculate g-type x-index
x_index(df = dat2, kw = "keywords", id = "id", cit = "citations", type = "g", dlm = "/")

# Create another example data frame
dat3 <- data.frame(citations = c(0, 1, 1, 2, 3, 5, 8),
                  keywords = c("a, b, c", "b, d", "c", "d", "e, g", "f", "g"),
                  id = c(123, 234, 345, 456, 567, 678, 789),
                  categories = c("a: d: e", "b", "c", "d: g", "e", "f", "g"))
# Calculate h-type x-index and produce plot
x_index(df = dat3, kw = "keywords", id = "id", cit = "citations", dlm = ",", plot = TRUE)
```

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