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PRISMA

Performance and Policy
Research In Sustainability
Measurement and Assessment

PRISMA – Centre for Sustainability Assessment and Policy

What hampers and what fosters sustainable operations in higher education?

A systematic review of barriers and success factors

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Dresden, 27/09/2017



DRESDEN
concept
Exzellenz aus
Wissenschaft
und Kultur

1. Motivation, objectives and definitions
2. Methodology
3. Data
 - General characteristics of the studies
 - Methodology
 - Objectives and motivation
 - Definitions
 - Treated subjects of the studies structured after the value chain circle
 - Researched dimension of sustainability
4. (Preliminary) Results
 - Success factors and barriers according the EOGI model

Sustainability gains more and more importance due to an increasing use of unsustainable resources (*Alshuwaikhat, Abubakar, Aina, Adenle, & Umair, 2017: 1-2*)

Higher education may focus its mission on sustainable development as educational organizations play a leading role in creating a sustainable society to a wide variety of stakeholders (*Calder & Clugston, 2003: 45; Cortese, 2003: 22*)

Institutions of higher education play important roles as actors in society (*Alshuwaikhat et al., 2017: 1-2*) and as productive **agents of change** towards sustainability (*Hansen & Lehmann, 2006: 821*)

As Sustainability is getting an important issue not only in the curriculum and research of universities, they are responsible for a sustainable development in their own operations too (they have a leading role)
(*Abubakar, Al-Shihri, & Ahmed, 2016: 1*)

Stakeholders demanding universities engaged in sustainable campus activities and operations (*Alshuwaikhat et al., 2017: 1-2; Conceição, Ehrenfeld, Heitor & Vieira, 2006: 438; Stephens, Hernandez, Román, Graham & Scholz, 2008: 333*)

Sustainability related to institutions of higher education is defined as the process of reducing environmental impacts resulting from campus decisions and activities raising environmental awareness

Creighton, S.H.(1999), Greening the Ivory Tower. Improving the Environmental Track Record of Universities, Colleges, and Other Institutions, MIT Press, Cambridge, MA

Intergenerational:

"development which meets the needs of current generations without compromising the ability of future generations to meet their own needs"
(Brundtland Commission 1987: 16)

Sustainable equilibrium with two tiers:

Three interacting dimensions : economy, environment and society

Time: short-, long- and longer-terms interactions *(Lozano, 2008)*

Sustainable operations of HEI:

- ➔ Raising awareness for all dimensions of sustainability and
- ➔ Acting as role model by developing the operations of the HEI with regard to all dimensions of sustainability

Defining operations in HEI's through the value chain circle adapted from Porter and refined by Guenther

Structuring the treated subjects of research papers according to the value chain model

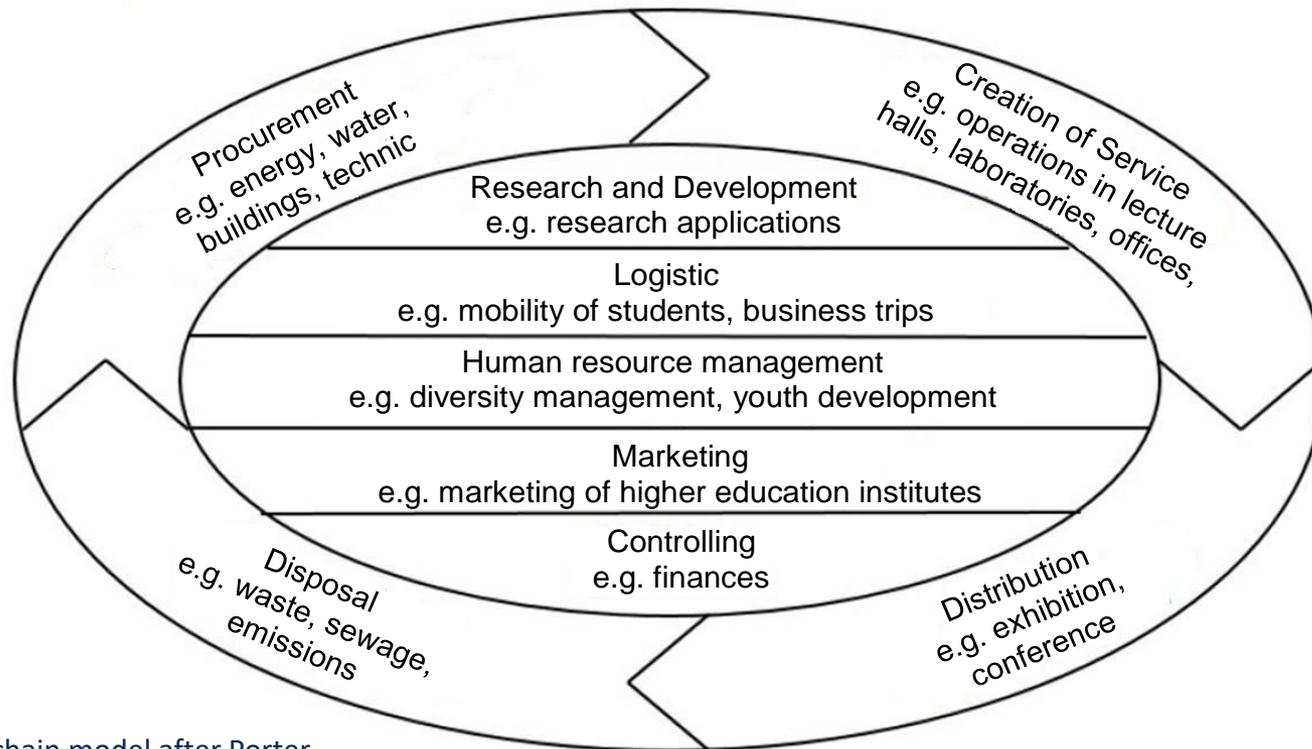


Figure 12: Value chain model after Porter

This is preliminary work, please do not cite.

Barriers influence the implementation of sustainability in a negative way (for example lack of awareness, lack of support, lack of resources...)

E. Verhulsta, W. Lambrechts, (2015) „Fostering the incorporation of sustainable development in higher education. Lessons learned from a change management perspective”, Journal of Cleaner Production, Volume 106, Pages 189–204

The **driving forces** for the change/implementation of sustainability influence the way the process is driven and accepted

Kaisu Sammalisto, Karin Arvidsson, (2005) "Environmental management in Swedish higher education: Directives, driving forces, hindrances, environmental aspects and environmental co-ordinators in Swedish universities", International Journal of Sustainability in Higher Education, Vol. 6 Issue: 1, pp.18-35, doi: 10.1108/14676370510573113

90% of innovations fail (*Hilgers & Piller 2009: 77*)

Identifications of barrier essential (*OECD & Eurostat 2005*)

Barriers “must be attended if the project is to **survive**” (*Link 1987: 11*)

Hemmnisse (Barrieren)

Factors, that hamper, decerate or even block innovation (*Mirrow et al. 2007, 2008*)

Innovation

“implementation of a **new or significantly improved** product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (*OECD & Eurostat 2005: 46*)

New in this context means new for organisations or individual (*Rogers 2003; Zain et al. 2002*)

Barriers influence the implementation of sustainability in a negative way (for example lack of awareness, lack of support, lack of resources...) (*Verhulst & Lambrechts, 2015*)

External Stakeholders

Stakeholder theory to analyse complex environments (*Waxenberger & Spencer 2003*)

Organization

TCOS Modell: „technological, commercial, organisational, and social uncertainties“ (*Hall & Martin 2005: 279*)

Dynamic Capabilities View:

Change in organizations through „competitive, technological, social, and regulatory“ shifts (*Barreto 2010: 257*)

Group

Organisational psychology (*Anderson et al. 2004*)

Individuum

“organizations do not behave, **people do**“ (*Klein & Kozlowski 2000: 7*)

External stakeholders

Investor

Potential employee

Supplier

Competitor

Organization

Customer

State

Society

Innovation value-added chain

Hueske & Guenther (2015): 199

External stakeholders

Investor

Potential employee

Supplier

Competitor

Organization

Strategy

Structure

Size

Resources

Organizational culture

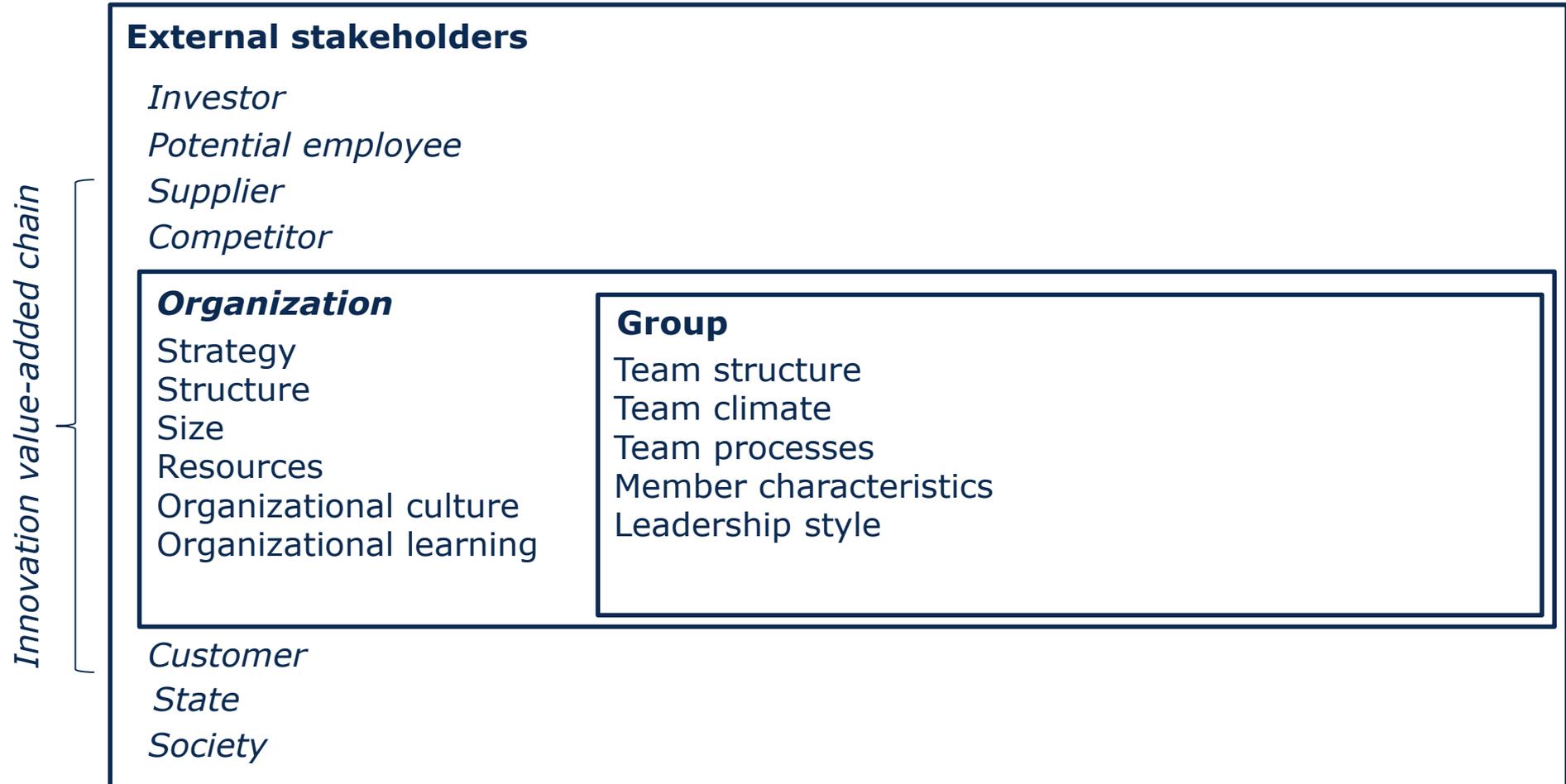
Organizational learning

Customer

State

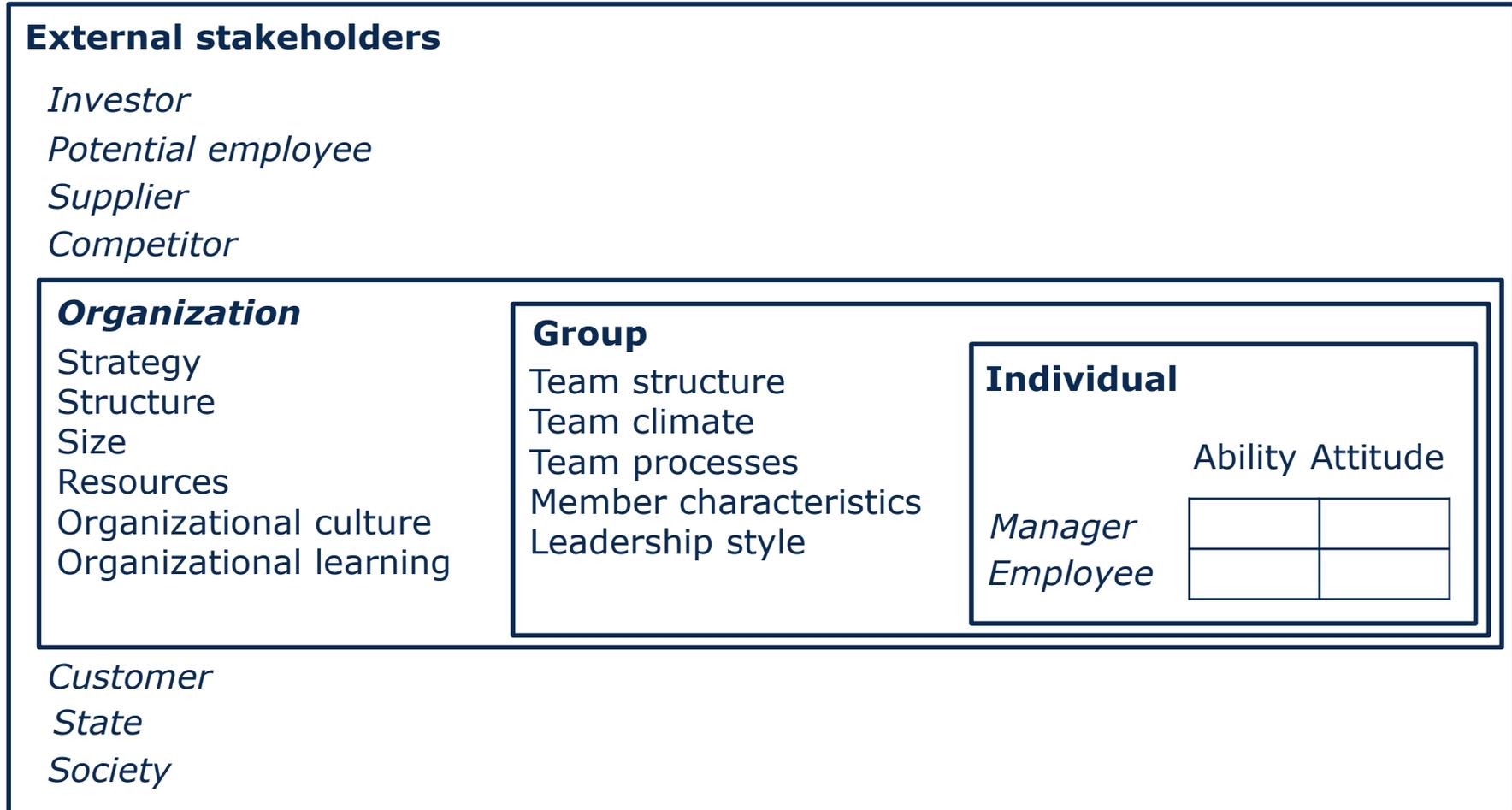
Society

Hueske & Guenther (2015): 199



Hueske & Guenther (2015): 199

Innovation value-added chain



Hueske & Guenther (2015): 199



Innovation value-added chain

External stakeholders

Investor (21)

Potential employee (5)

Supplier (21)

Competitor (24)

Organization

Strategy (105)

Structure (121)

Size (11)

Resources (157)

Organizational culture (38)

Organizational learning
(44)

Group

Team structure (6)

Team climate (9)

Team processes (5)

Member characteristics
(6)

Leadership style (11)

Individual

Ability Attitude

Manager

47

89

Employee

73

85

Customer 36)

State (14)

Society (14)

Hueske & Guenther (2015): 199ff.

Sub-category	Number of studies	Exemplary quotes
Investor	21	“Lack of venture capital” (Hadjimanolis 1999, p. 567), “problems obtaining external funding” (Herath 2010, p. 271), “amount of available credit” (Love et al. 2001, p. 37)
Potential employee	5	“Staffing availability/ recruiting” (Gocmen and Ventura 2010, p. 177), “lack of experts” (Nečadová and Scholleová 2011, p. 835)
Supplier	21	“Resistance from suppliers” (Zutshi and Sohal 2004, p. 348), “missing experience of the suppliers” (Wirtz et al. 2010, p. 29), lack of preparedness on side of suppliers” (Mudgal et al. 2010, p. 90), “no joint planning with supplier” (Jun et al. 2004, p. 67), support from vendors” (Waldron 2005, p. 247)
Competitor	24	“Competitors may interfere/influence other trading partner” (Koh et al. 2008, p. 260), “market dominated by established companies” (Reynolds and Hristov 2009, p. 323)

Hueske & Guenther (2015): 129

“**Change drivers** are events, activities, or behaviors that facilitate the implementation of change by providing an understanding of the need for change, describing the change vision and initiatives, fostering or training employees on new work routines, processes, models, and or values, or embedding changes in the culture.”

(Whelan-Berry, Gordon & Hinings, 2003: 100)

For example changes in organizational structure or processes in human resource practices as well as types of leadership, vision, communication and training have been identified as drivers of change *(Whelan-Berry & Somerville, 2010: 176)*

The **driving forces** for the change/implementation of sustainability influence the way the process is driven and accepted

(Sammalisto & Arvidsson, 2005)

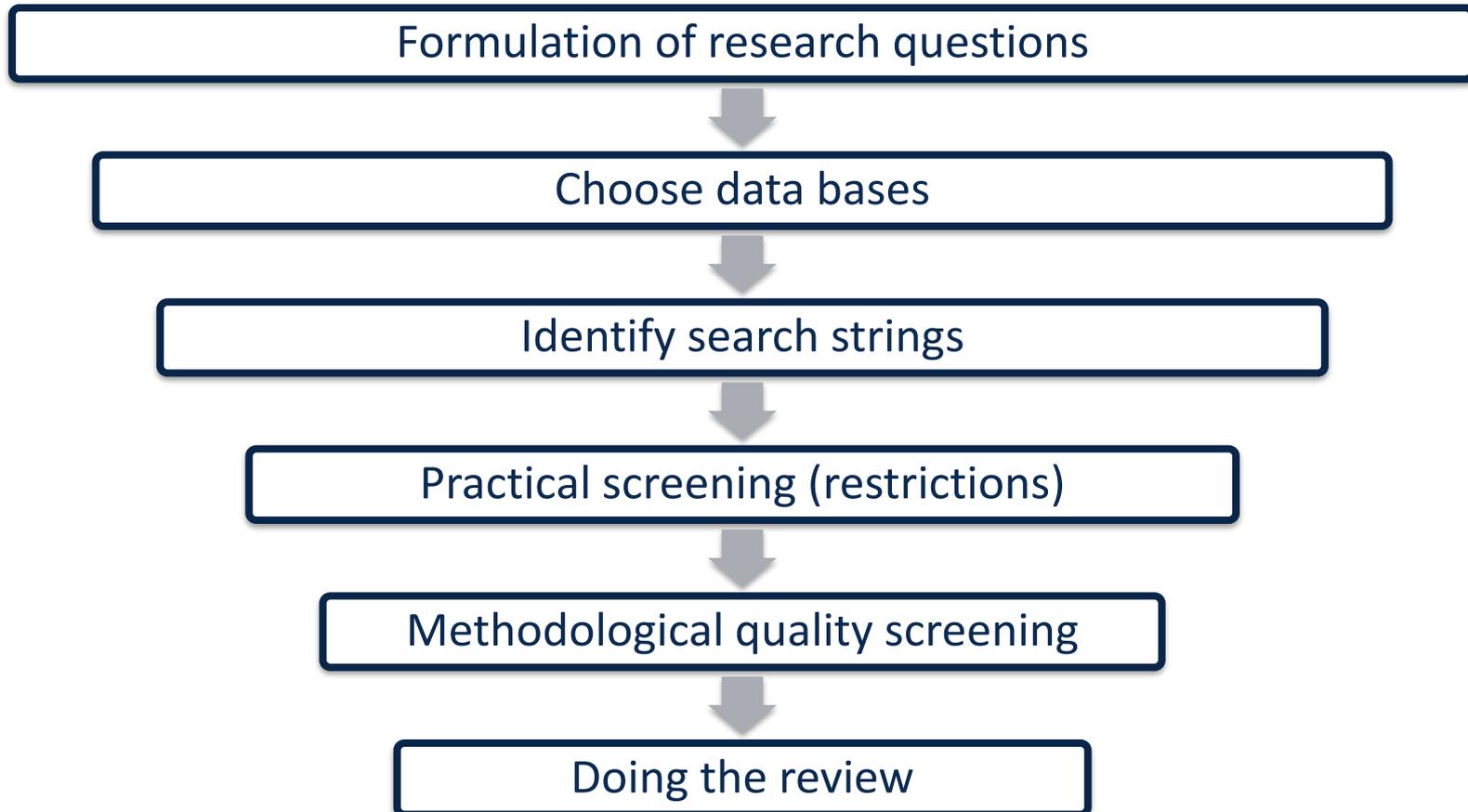


Figure 1: Steps of a systematic literature review after Fink (*Fink, 2010: 4*)

Table 3: Documentation of literature research

Data Source	Search Strings	Results
BSC und ASC	Sustainab*	731 (79)
Web of Science	AND "high* education*" OR universit* OR "Hel"	654 (66)
Wiso	AND barrier* OR hurdle* OR hamper* OR obstacl* OR impediment* OR fail* OR "success* factor" OR driver*	69 (8)
PsycInfo	OR "driving force*" OR trigger* OR enabler*	163 (5)
BSC und ASC	Nachhaltig*	11 (0)
Web of Science	AND Universit* OR Hochschule*	1 (0)
Wiso	AND barriere* OR Hemmnis* OR Hindernis* OR Erfolgsfaktor*	38 (0)
PsycInfo	OR Auslöser	1 (0)

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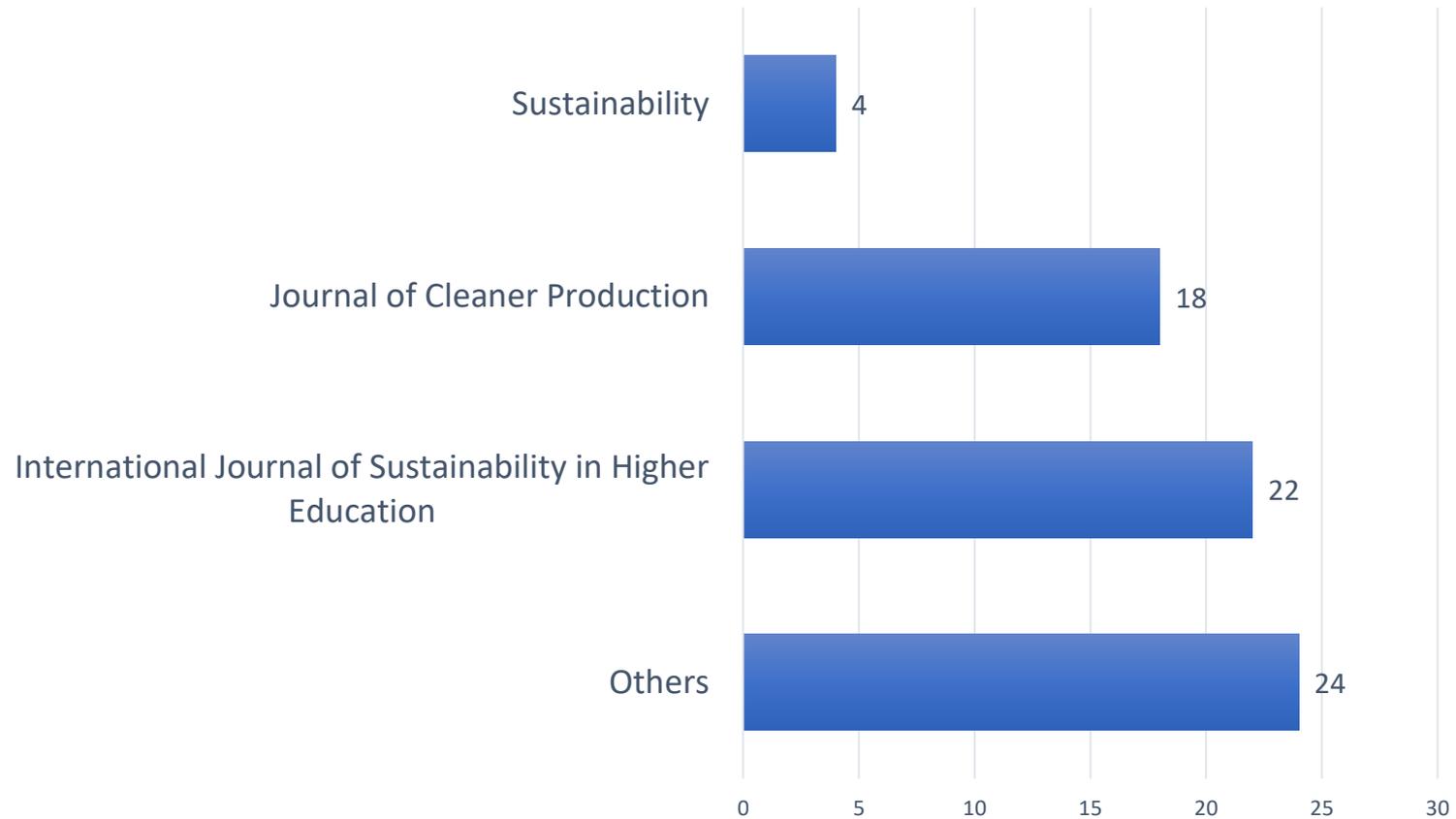
1668 Results

**158 Results
- 32 Duplications
= 126 Results**

83 Research Paper

This is preliminary work, please do not cite.

Publications per Journal



This is preliminary work, please do not cite.

Figure 4: Number of studies according the type of journal (review from research work, July 2017)

Geographic origin of publications

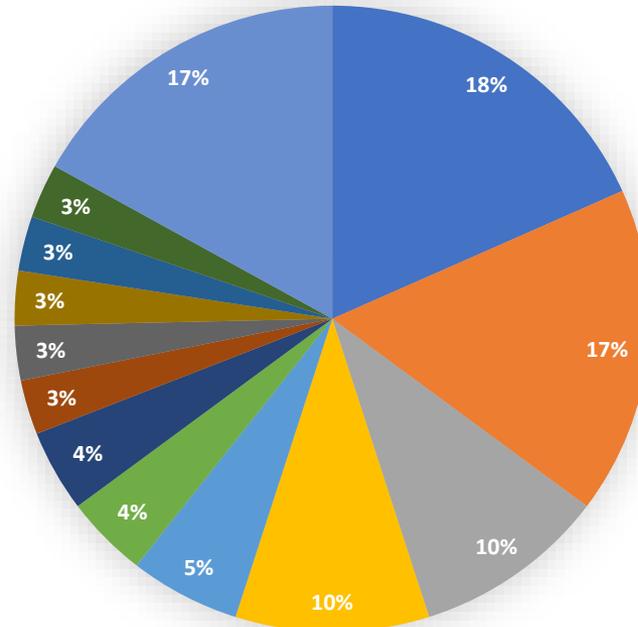


Figure 5: Number of studies according the geographic origin of the publication (review from research work, July 2017)

This is preliminary work, please do not cite.

Publications per year

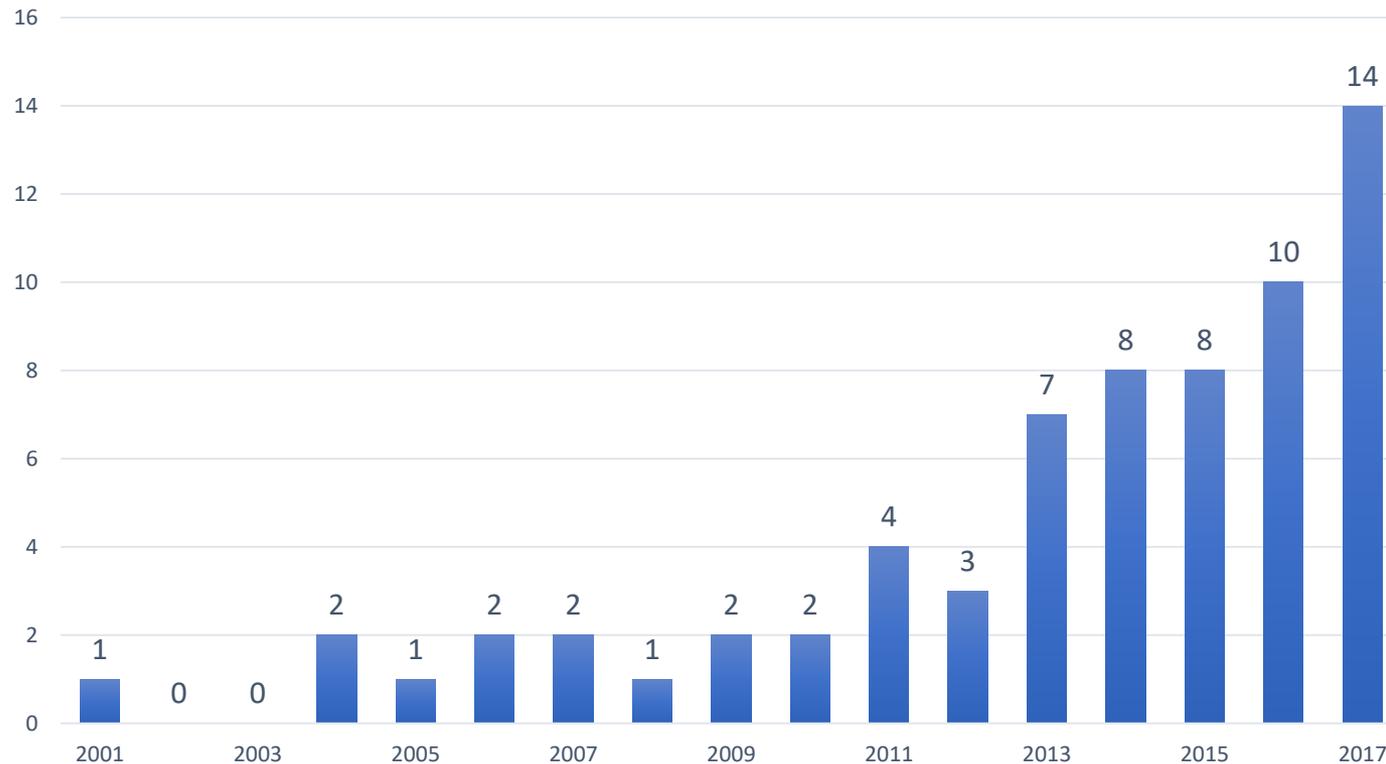


Figure 6: Number of studies according the year of publication (review from research work, July 2017)

This is preliminary work, please do not cite.

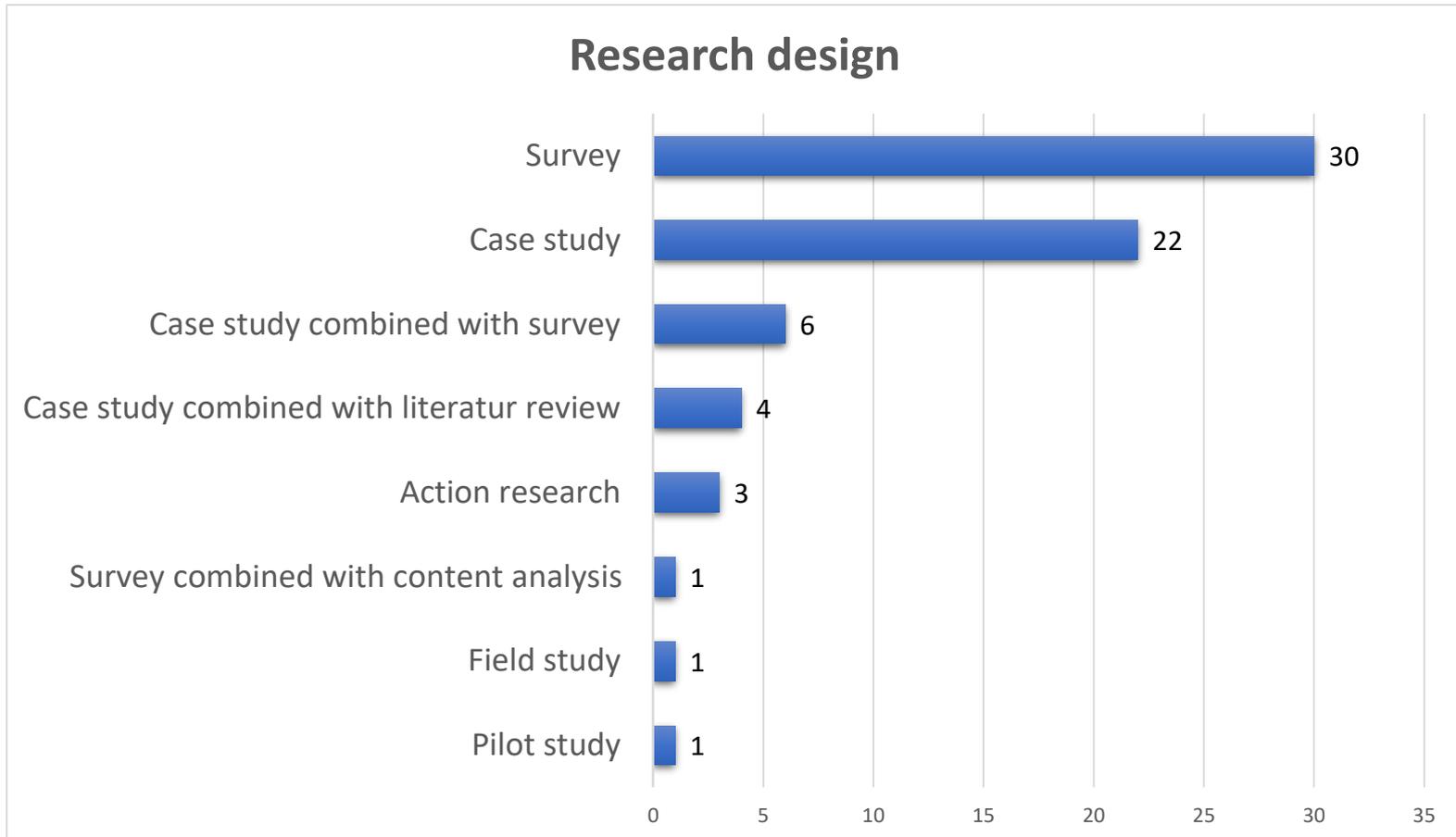


Figure 7: Number of studies according the research design (review from research work, July 2017)

This is preliminary work, please do not cite.

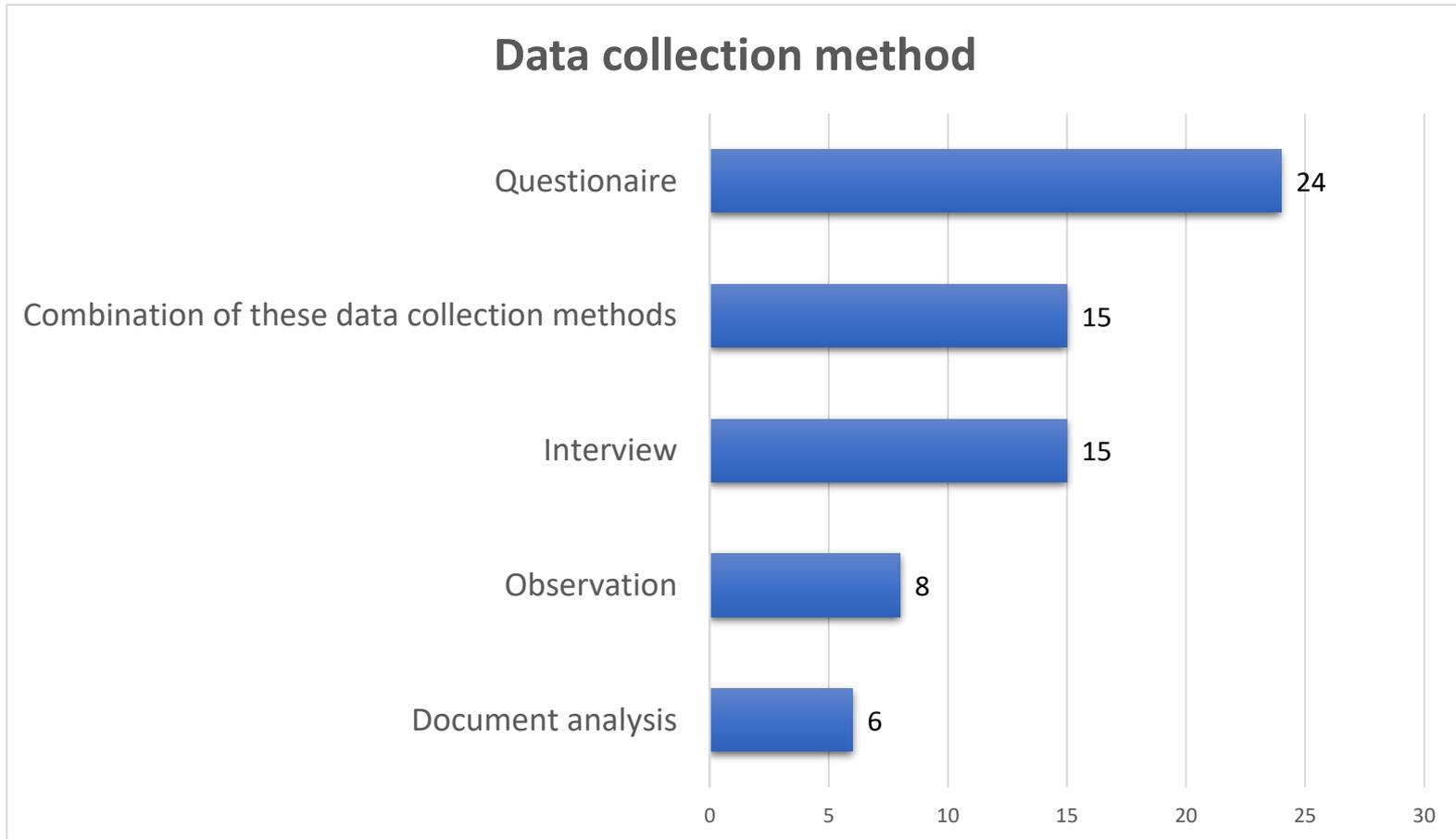


Figure 8: Number of studies according the data collection method (review from research work, July 2017)

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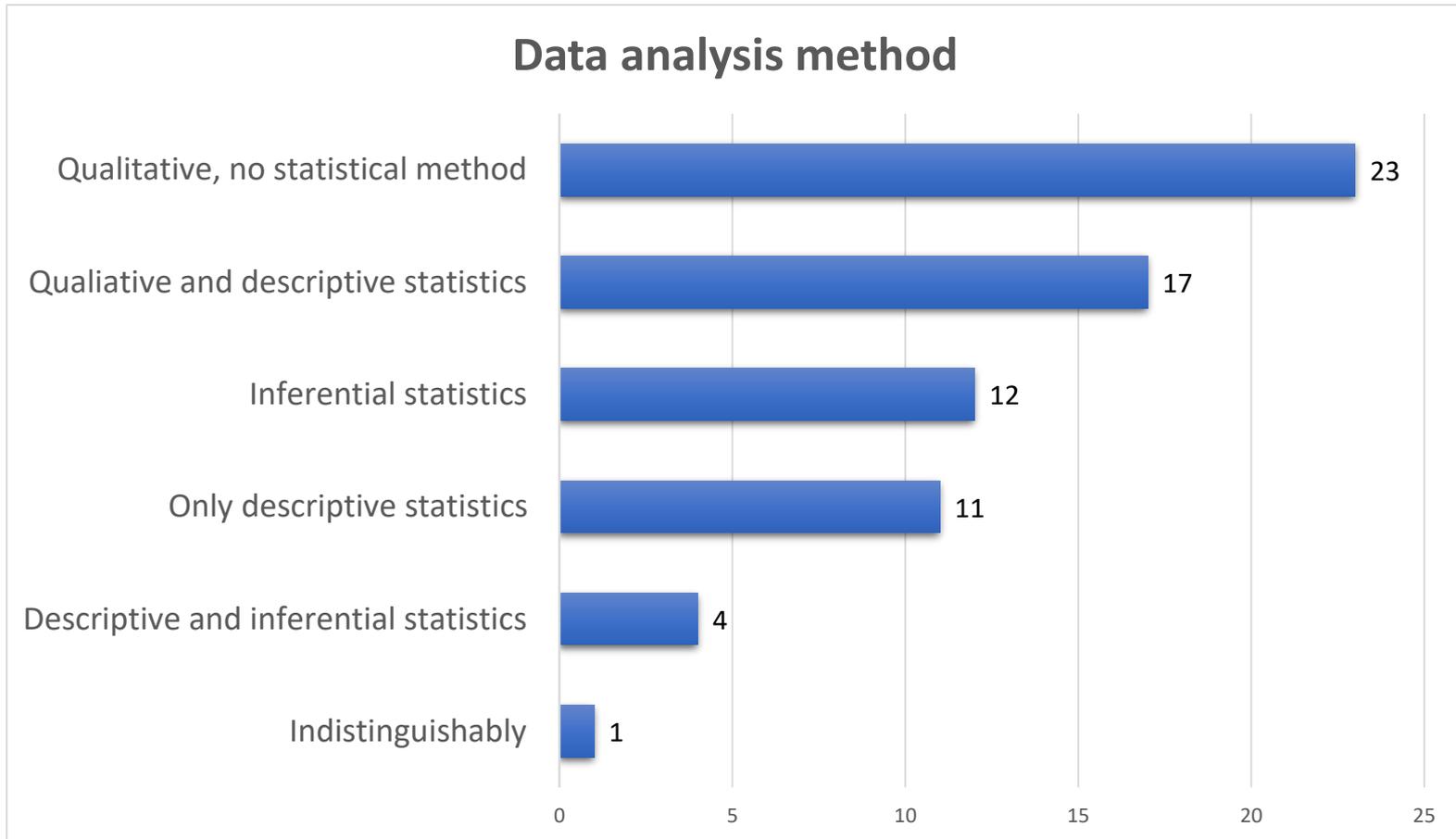


Figure 9: Number of studies according the data analysis method (review from research work, July 2017)

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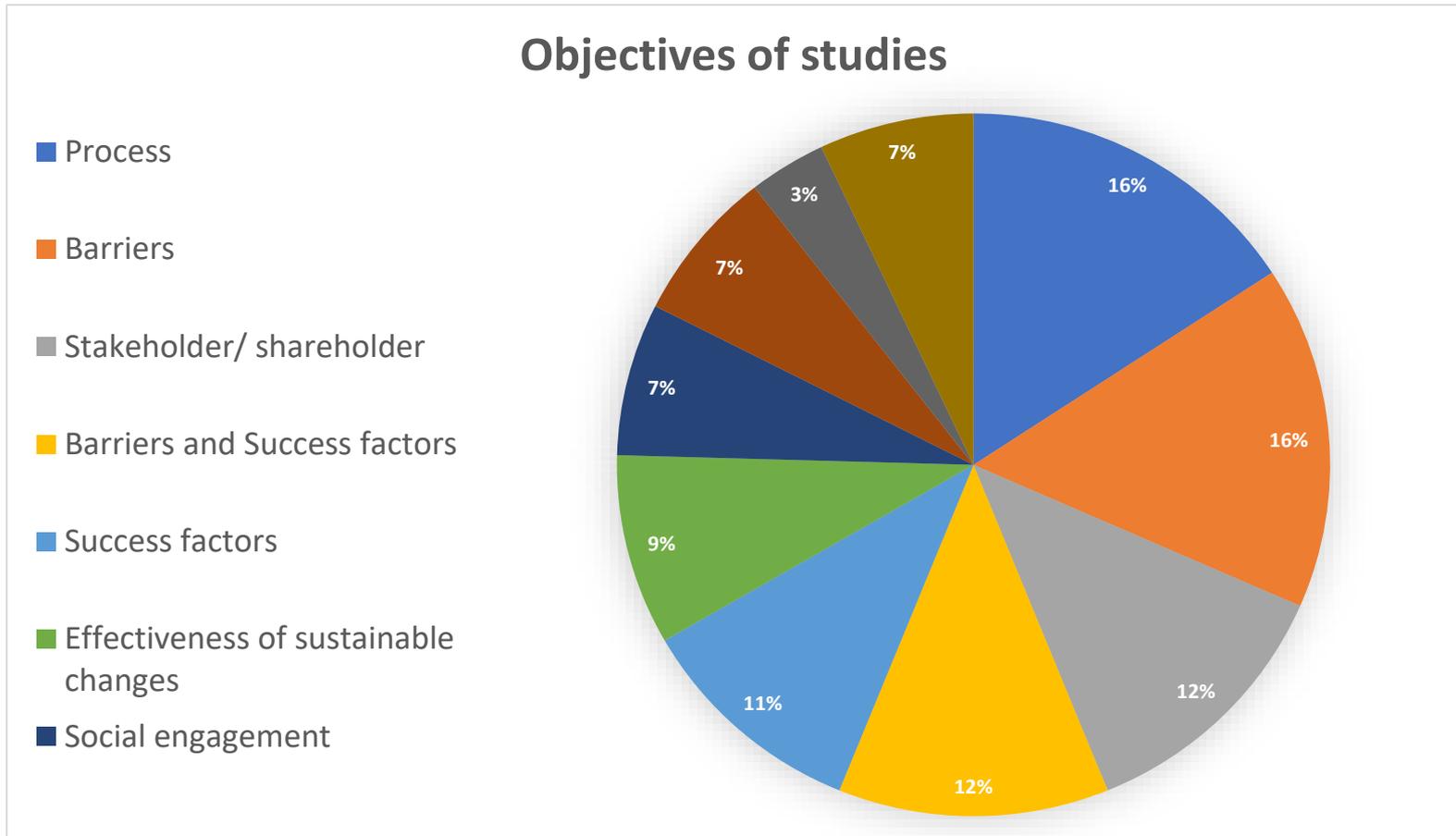


Figure 10: Number of studies according the objectives (review from research work, July 2017)

This is preliminary work, please do not cite.

Definition of sustainability

Table 8: Overview definitions of sustainability according particularly criteria (review from research work, July 2017)

	All dimensions mentioned (environmental, social and economic dimension)	Only environmental dimension mentioned	No dimension considered	Total result
Indistinguishable	2	3	1	6
Intergenerational	1	2	7	10
Total result	3	5	8	16

(own research.)

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Definition of sustainability in operations of HEI's

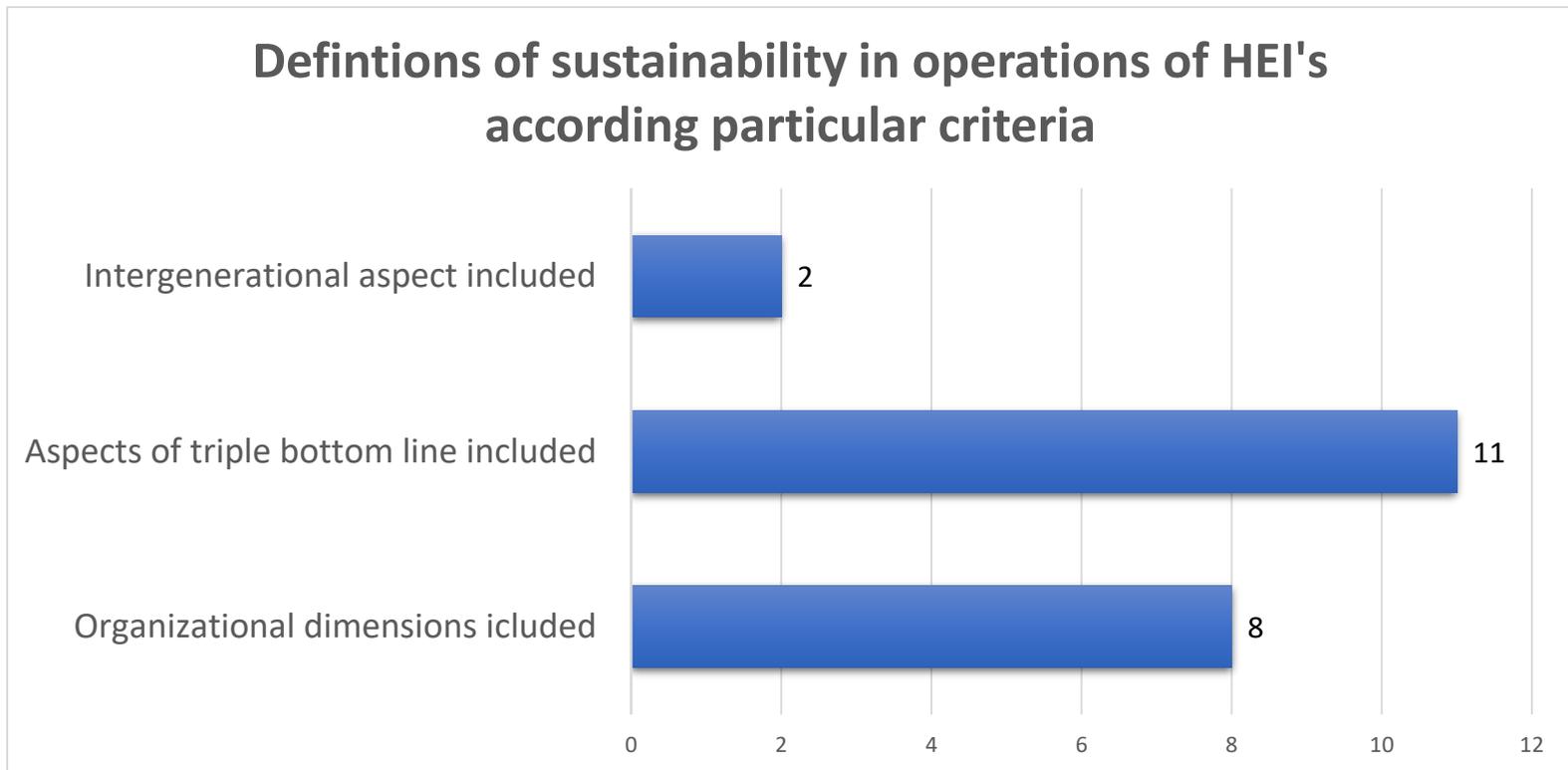


Figure 11: Number of studies according the year of publication (review from research work, July 2017)

This is preliminary work, please do not cite.

Definition of sustainability in operations of HEI's

Table 9: Overview definitions of sustainable operations in HEI's according particularly criteria (review from research work, July 2017)

	Organizational dimensions included	Organizational dimensions not included	Total result
Social dimension	5	3	8
Economic dimension	4	2	6
Environmental dimension	6	5	11

(own research.)

This is preliminary work, please do not cite.

No results for the definition of barriers and success factors

No results for the definition of operations in HEI's

This is preliminary work, please do not cite.

Defining operations in HEI's through the value chain circle adapted from Porter and refined by Guenther

Structuring the treated subjects of research papers according to the value chain model

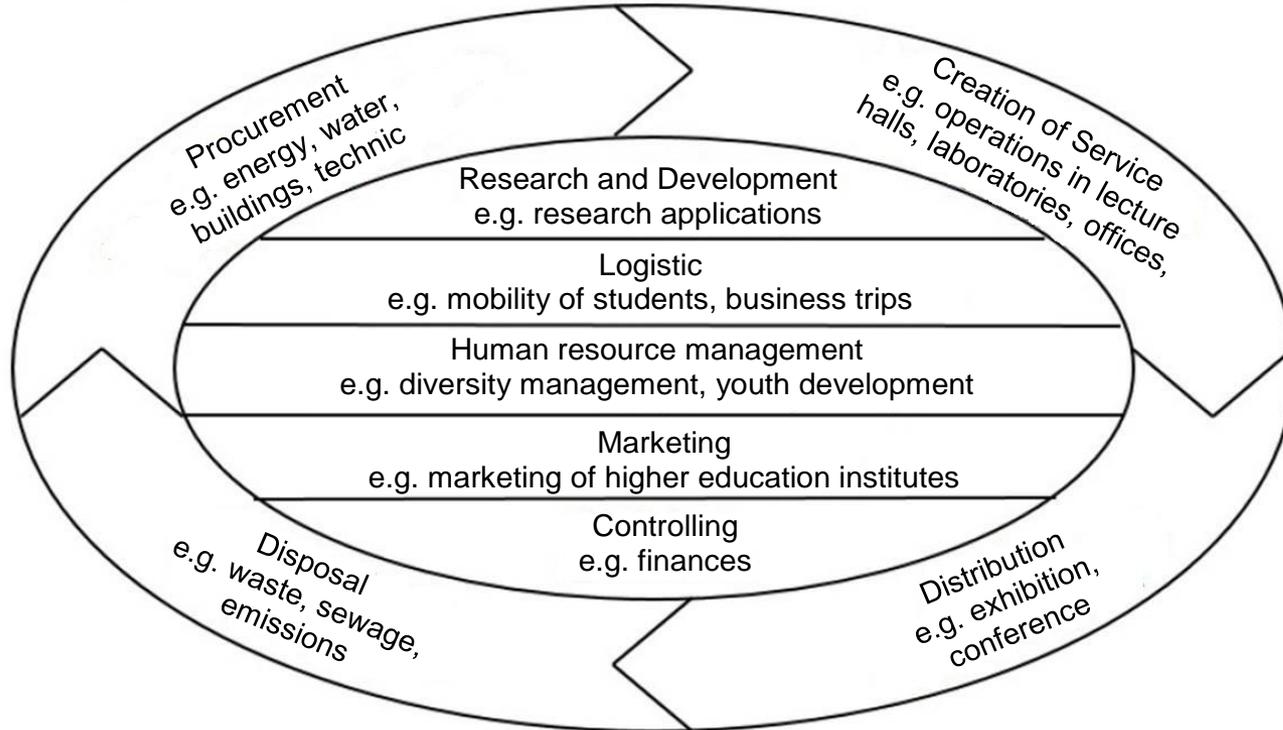
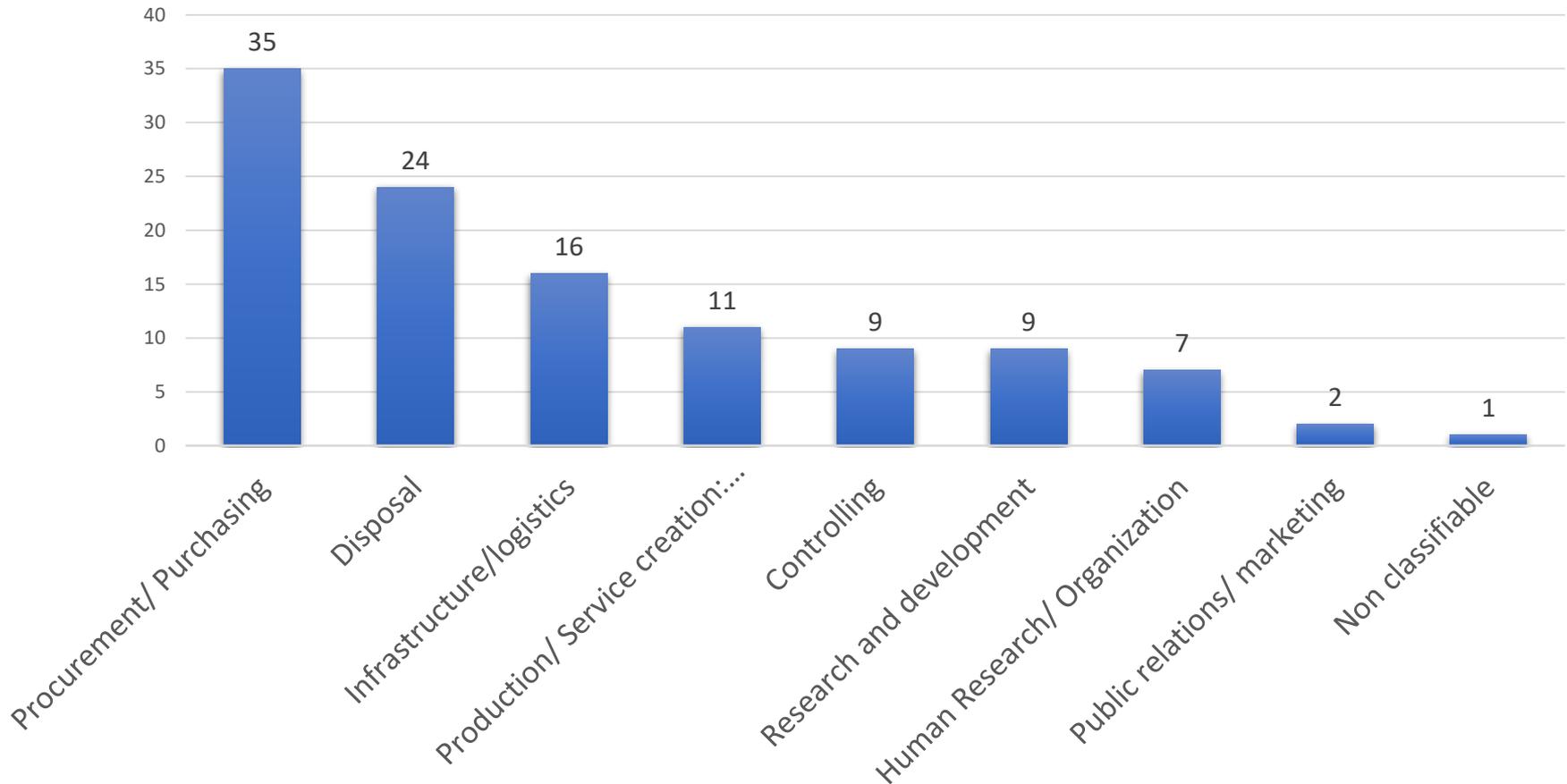


Figure 12: Value chain model after Porter

This is preliminary work, please do not cite.

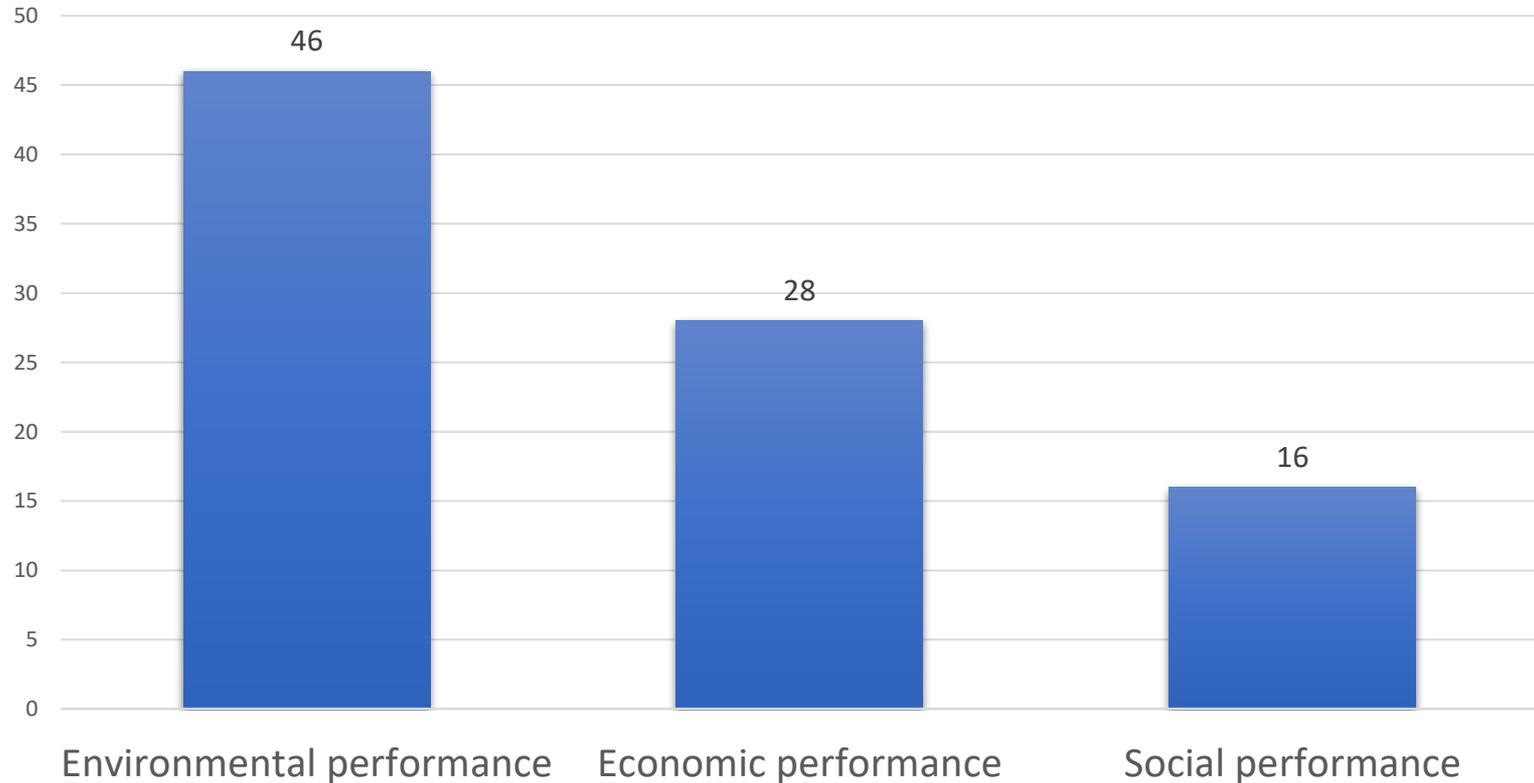
Treated subjects structured according the value chain circle



This is preliminary work, please do not cite.

Figure 13: Number of treated subjects according the value chain circle (from 48 analyzed research papers)

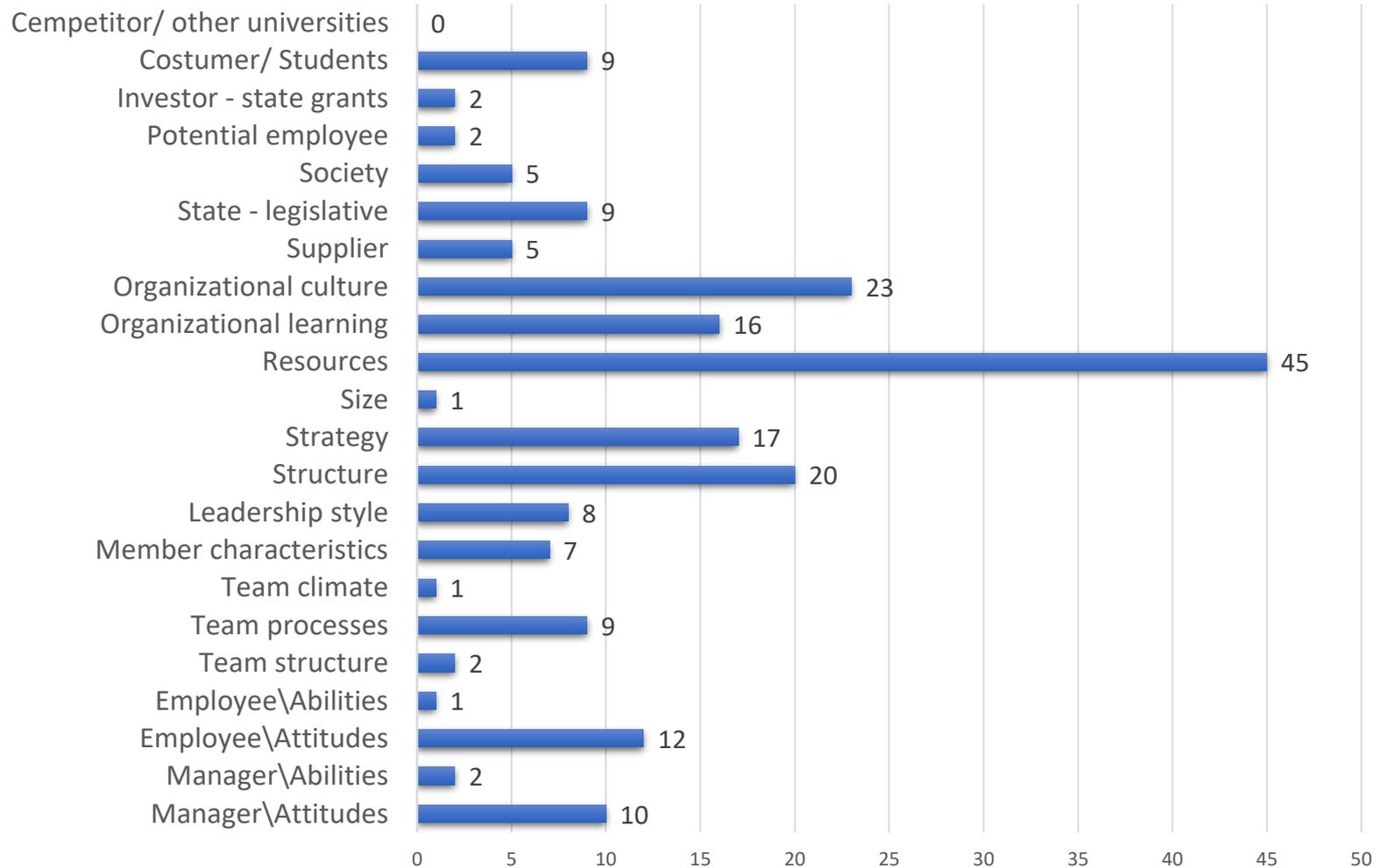
Researched dimension of sustainability



This is preliminary work, please do not cite.

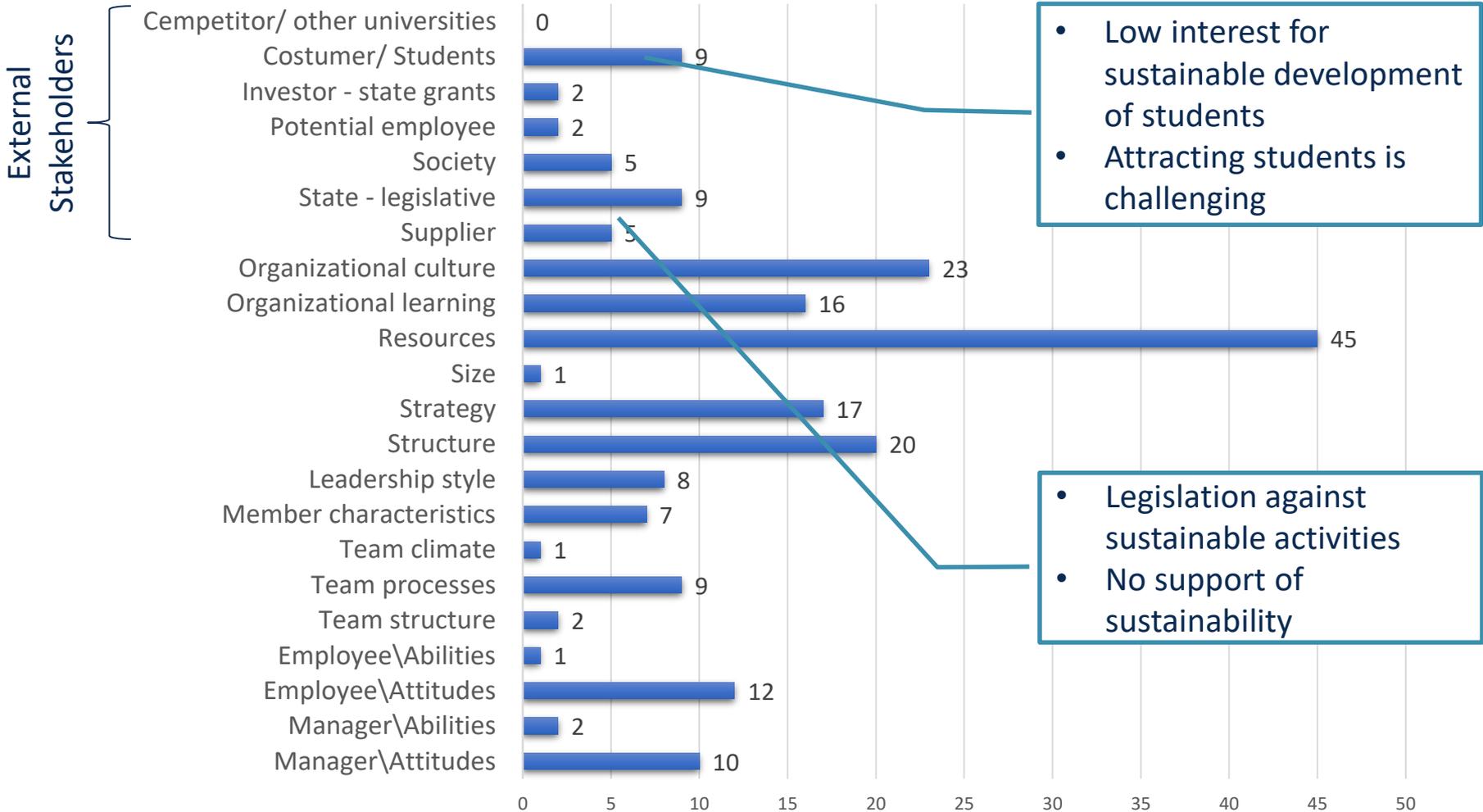
Figure 14: Number of research papers structured after the researched dimension of sustainability (from 48 analyzed research papers)

Barriers according the EOGI model



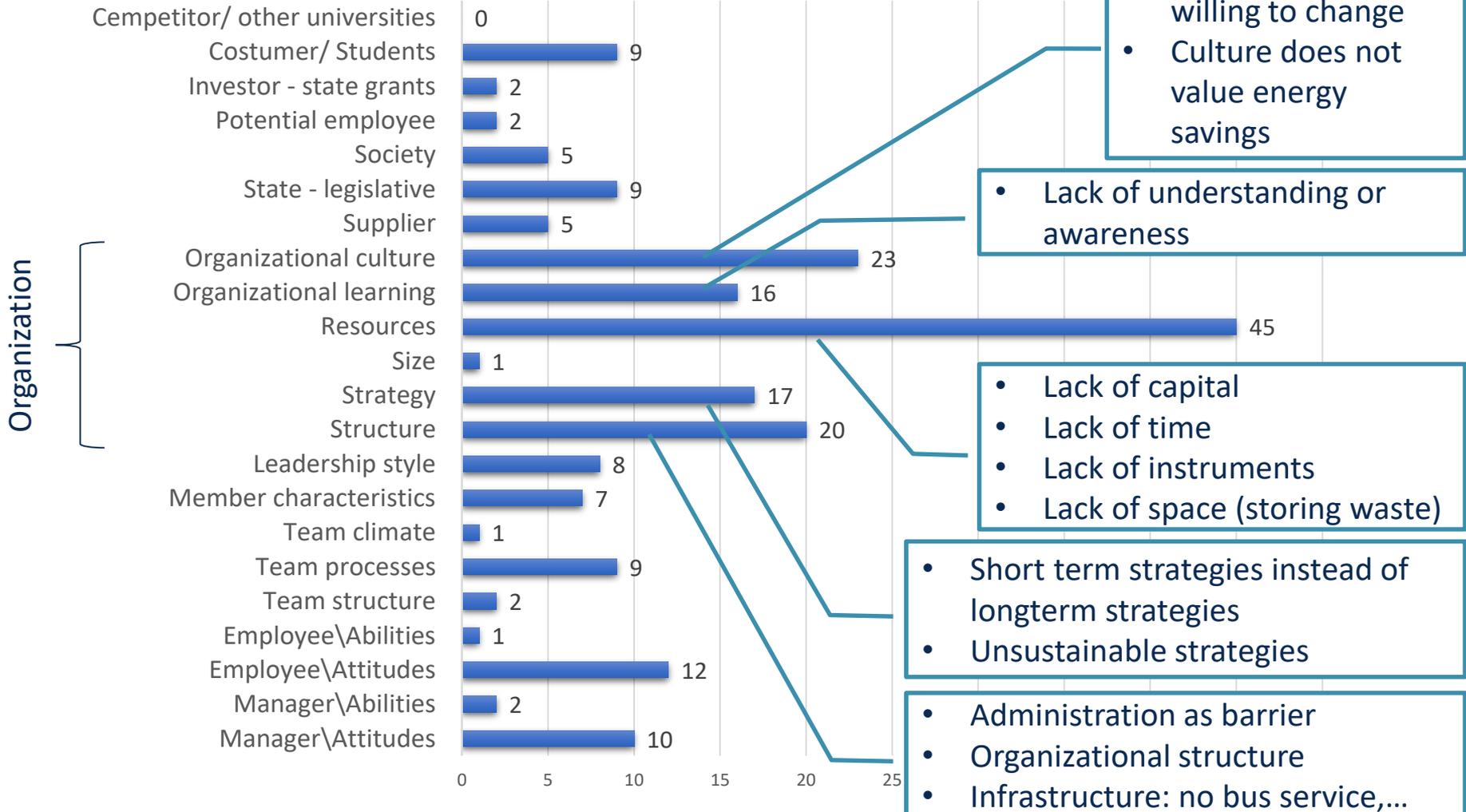
This is preliminary work, please do not cite.

Barriers according the EOGI model



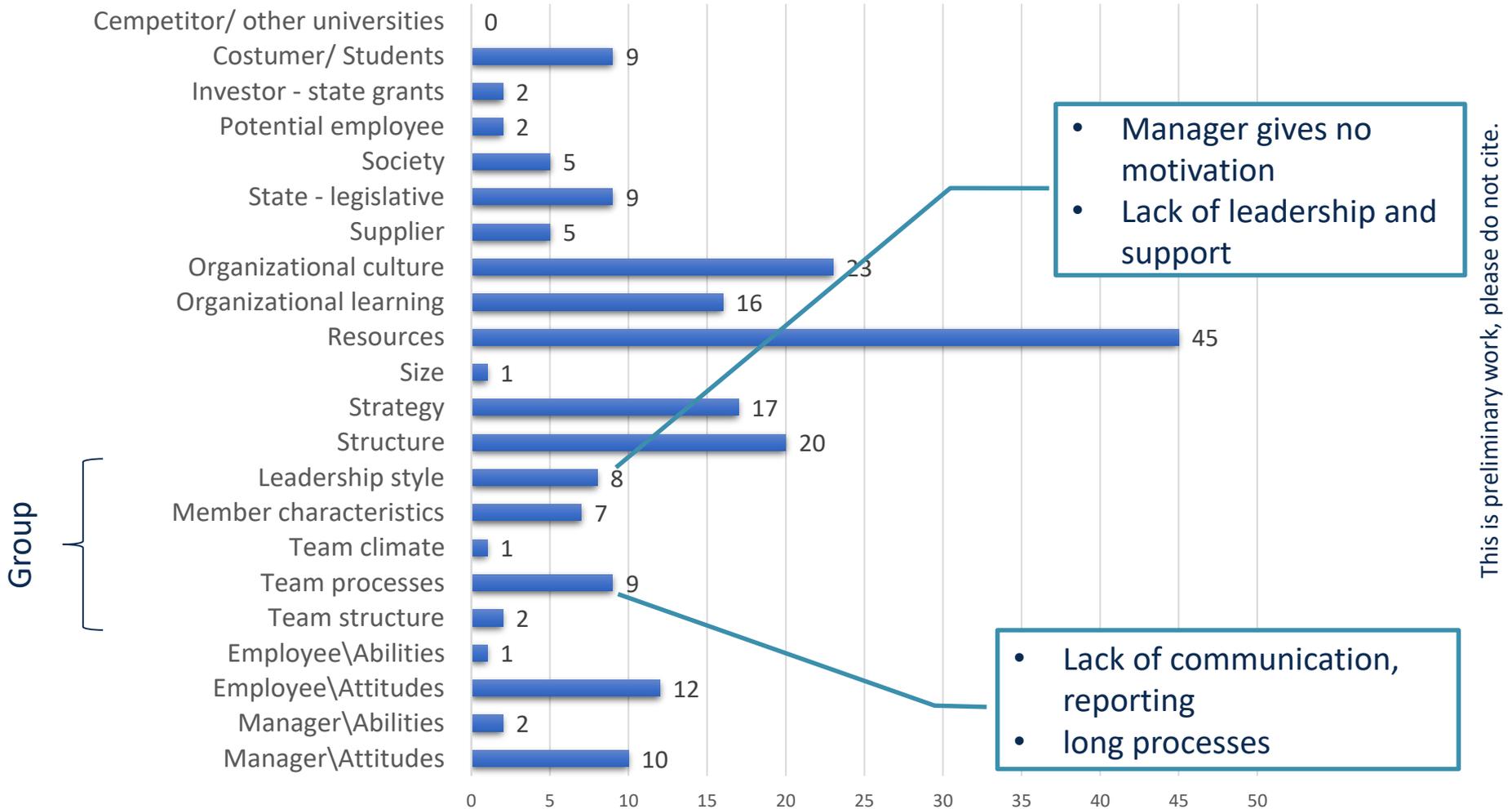
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Barriers according the EOGI model

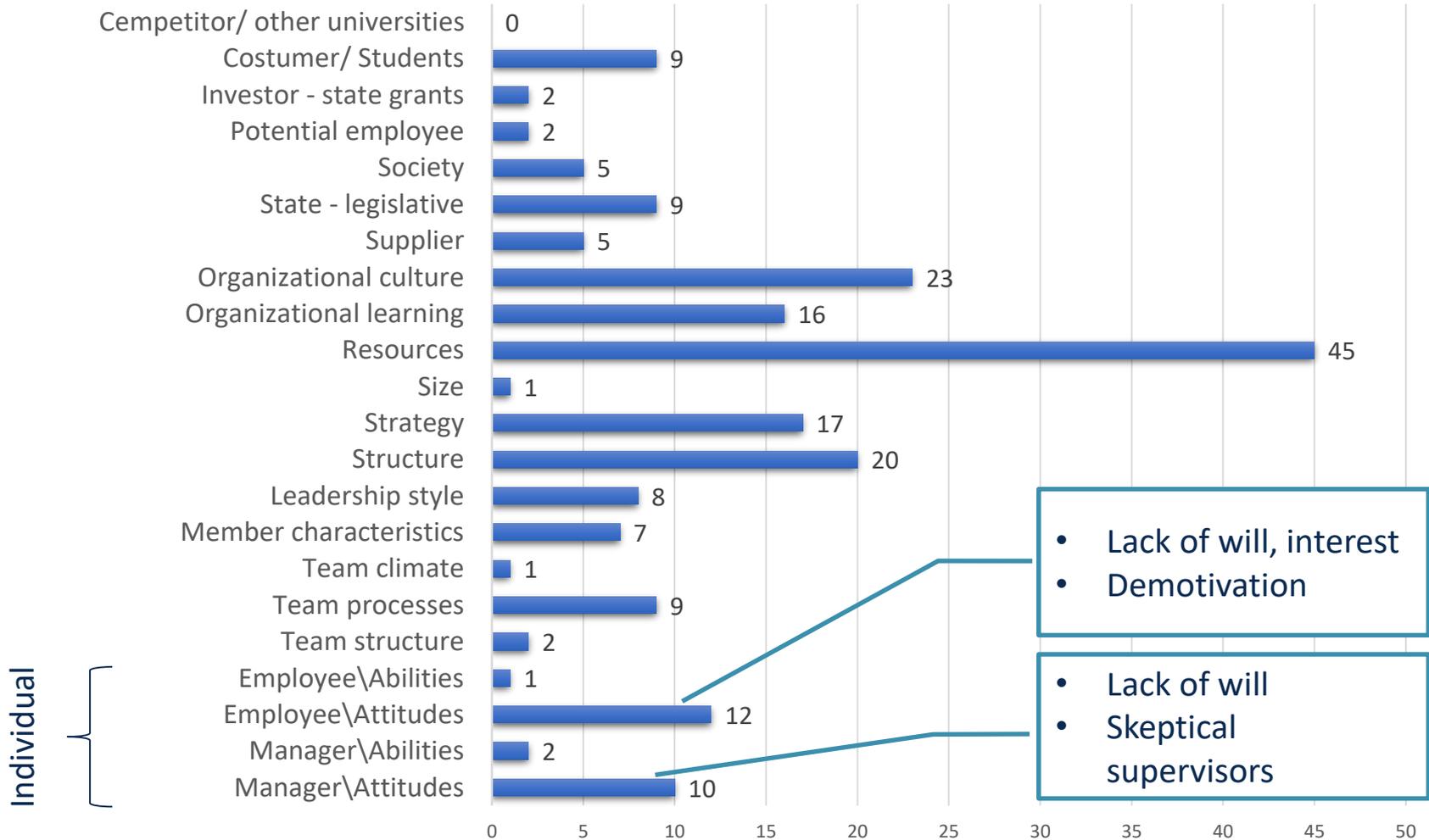


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Barriers according the EOGI model

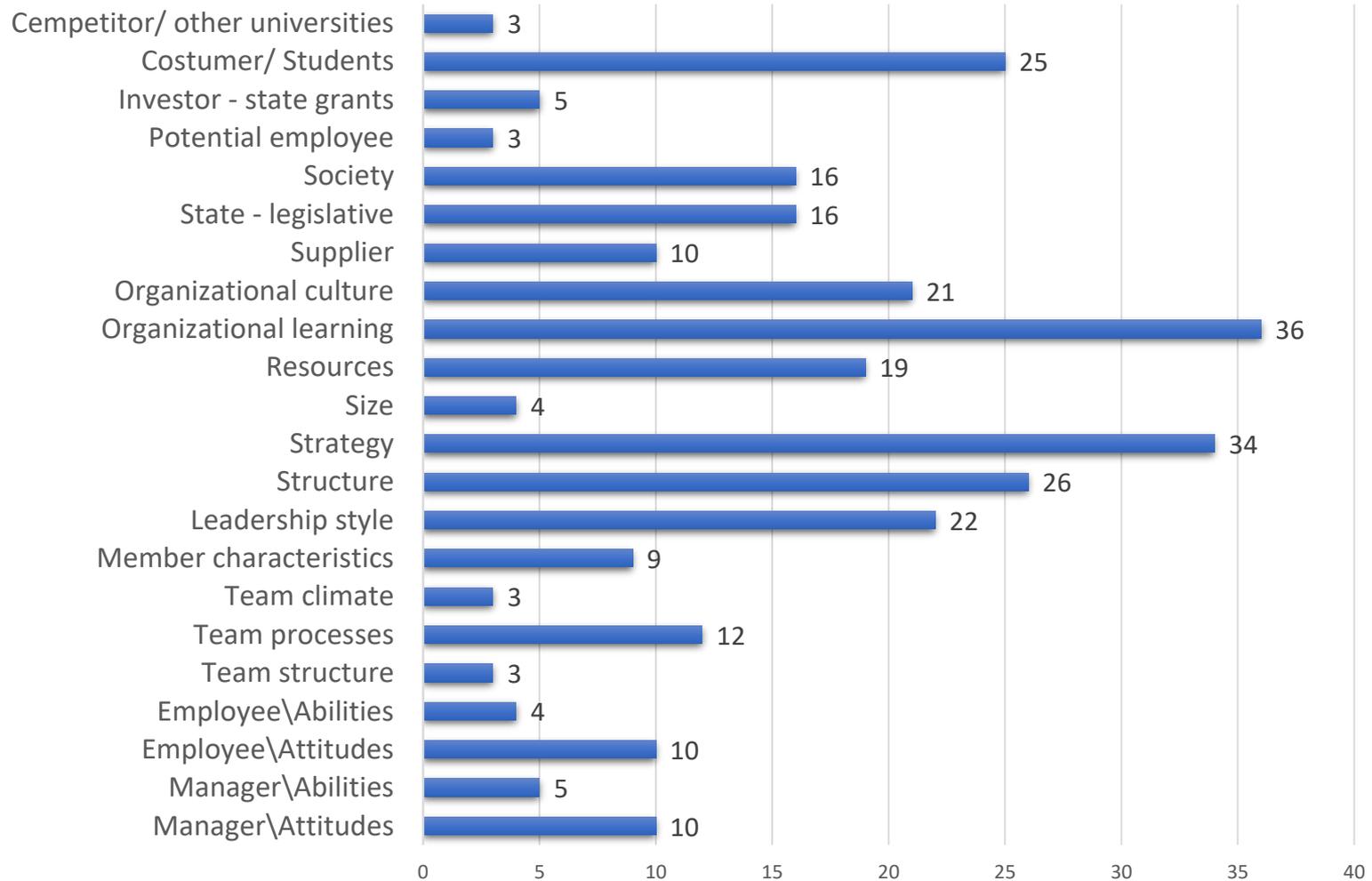


Barriers according the EOGI model



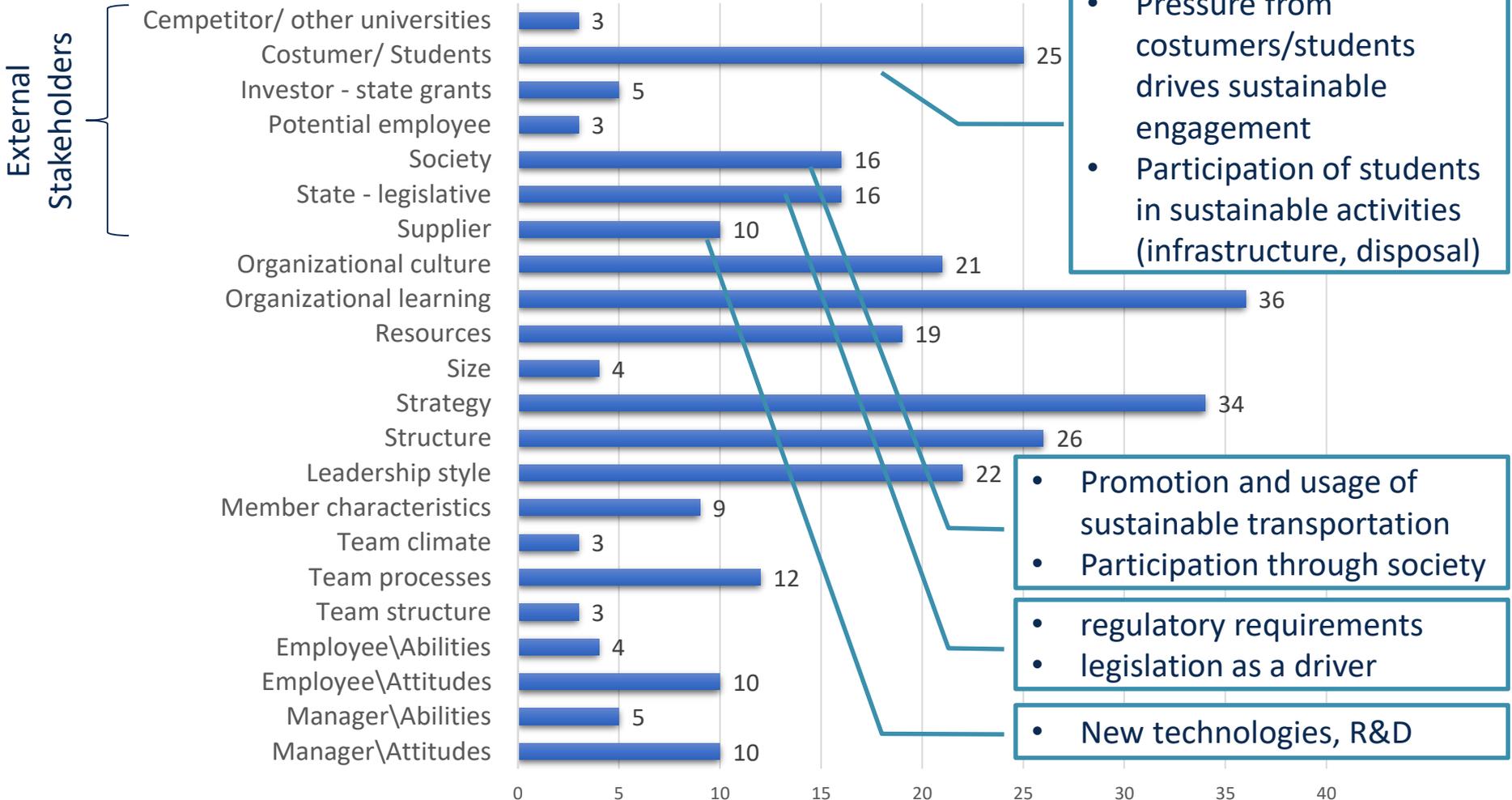
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Success factors according the EOGI model



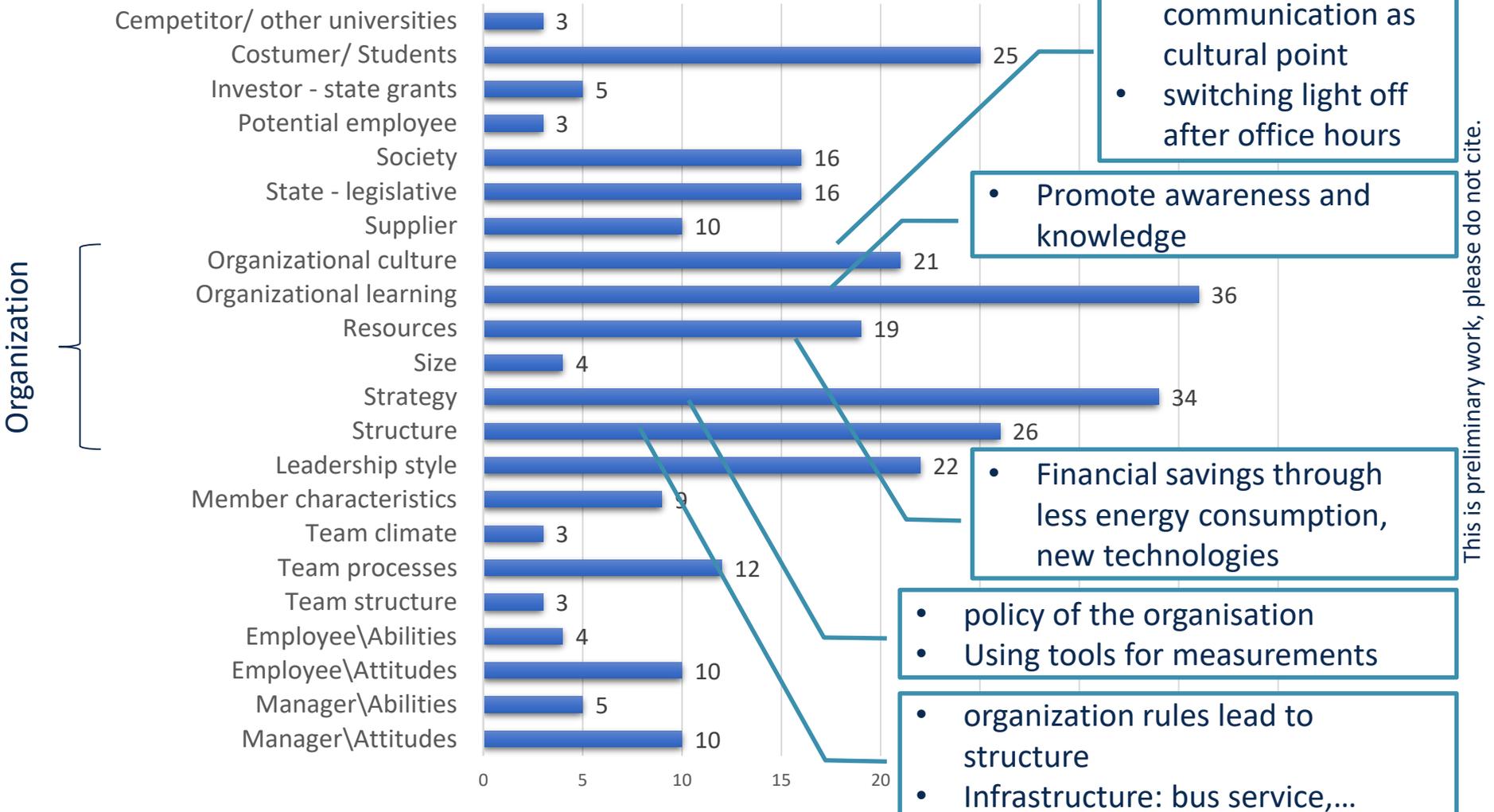
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Success factors according the EOGI model



This is preliminary work, please do not cite.

Success factors according the EOGI model

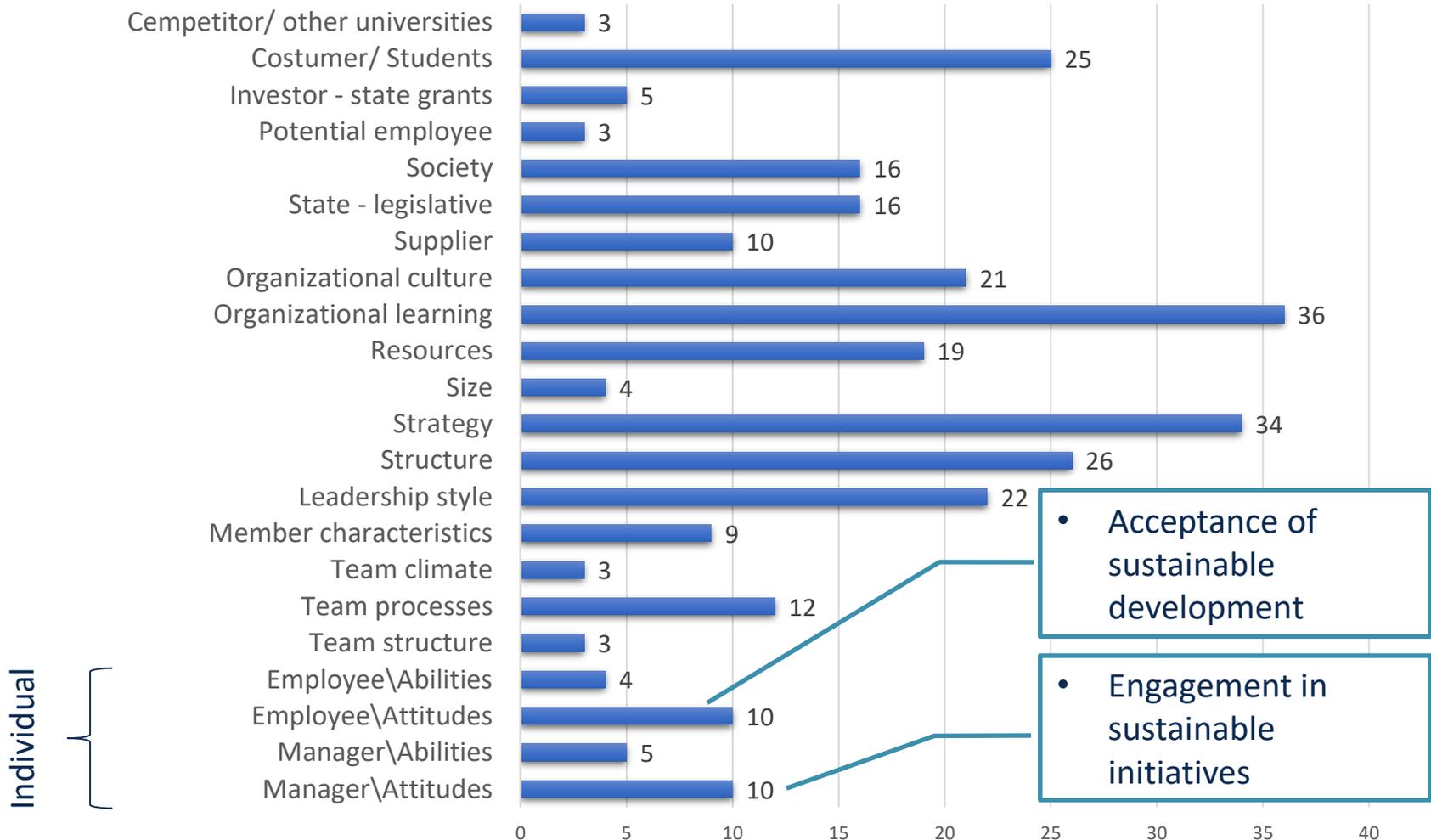


Success factors according the EOGI model



This is preliminary work, please do not cite.

Success factors according the EOGI model



This is preliminary work, please do not cite.

External stakeholders

Investor (2; 5)

Potential employee (2; 3)

Supplier (5; 10)

Competitor (0; 3)

Organization

Strategy (17; 34)

Structure (20; 26)

Size (1; 4)

Resources (45; 19)

Organizational culture
(23; 21)

Organizational learning
(16; 36)

Customer (9; 25)

State (9; 16)

Society (5; 16)

Group

Team structure (2; 3)

Team climate (1; 3)

Team processes (9; 12)

Member characteristics
(7; 9)

Leadership style (8; 22)

Individual

	Ability	Attitude
<i>Manager</i>	2; 5	10; 10
<i>Employee</i>	1; 4	12; 10

Thank you for your attention!

For more questions: www.tu-dresden.de/wwbwlbu
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Operations of HEI: Wertschöpfungskreis nach Porter

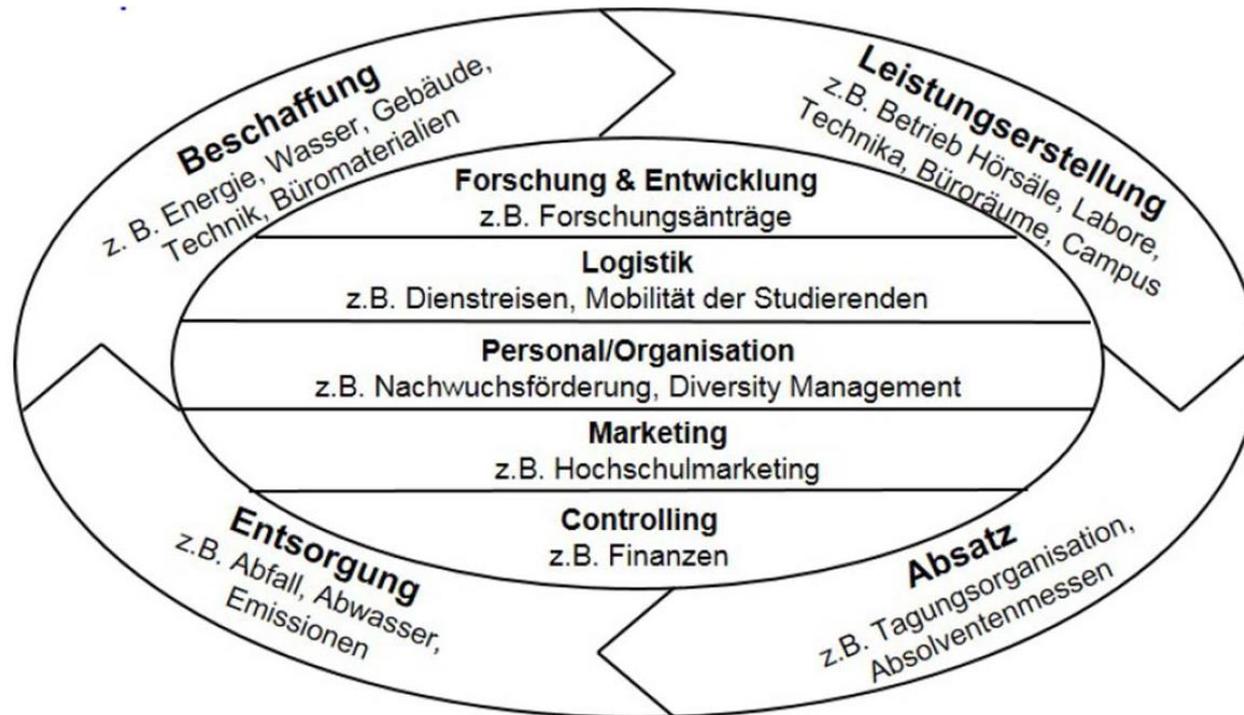


Abbildung 4: Aktivitäten des Wertschöpfungskreises einer Hochschule

Quelle: in Anlehnung an Günther 2008, S. 173 und Porter 2000, S. 66

- recycling, waste management, paper use
- Green purchasing
- EMS (Environmental Management System)
- Results related to triple bottom line
- Greening a Campus (Campus Case studies)
- Reducing Food Choice
- Sustainable education, greening curricula
- Energy use
- Green IT in Africa
- Behavioural barriers to campus sustainability
- Solid waste and energy management
- Building sustainable laboratories
- Topics related to stakeholder

This is preliminary work, please do not cite.

Main Category	Sub Category	Example
Bibliographic data	Author(s) <i>Who is/ are the Author/s of the Research Paper?</i>	Irina Safitri Zen, Deivendran Subramaniam, Hanizam Sulaiman, Abd Latif Saleh, Wahid Omar, Mohd Razman Salim
	Year <i>In which year was the paper published?</i>	2016
	Title <i>What is the title of the research paper?</i>	Institutionalize waste minimization governance towards campus sustainability: A case study of Green Office initiatives in Universiti Teknologi Malaysia

Main Category	Sub Category	Example
Bibliographic data	Geographic origin of the paper <i>Where was the research paper published?</i>	Malaysia
	Type of journal <i>What is the name of the journal where the paper was published?</i>	Journal of Cleaner Production

Main Category	Sub Category	Example
Definitions	Def. of sustainability <i>How is “sustainability” defined?</i>	Brundtland definition of sustainable development: “development that meets the needs of the present without compromising the ability of future generations to meet their needs” (Zahid, Ghazali, & Rahman, 2017)
	Def. of operations in HEI <i>How are “operations in HEI” defined?</i>	...not only do these institutions feed and house individuals, but also service multiple-use facilities and manage “infrastructure, utilities, transportation and disposal systems”. (Owens & Legere, 2015)

Main Category	Sub Category	Example
Definitions	Def. of sustainable operations in HEI <i>How are “sustainable operations in HEI” defined?</i>	<ul style="list-style-type: none"> - “The use of goods and services..., while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations” - “...the active process of establishing your initiative ... developing relationships, practices, and procedures that become a lasting part of the community”

Main Category	Sub Category	Example
Definitions	Def. of success factors and barriers related to sustainable operations in HEI <i>How are “success factors and barriers related to sustainable operations in HEI” defined?</i>	This paper defines a barrier according to Sorrell et al. (2004) as, “a mechanism that inhibits a decision or behavior that appears to be both energy efficient and economically efficient” (Maiorano & Savan, 2015)

Main Category	Sub Category	Example
Objective of the publication	Objective <i>What is the objective of the research paper?</i>	Furthermore, the aim of this study is to demonstrate how HEIs in Malaysia adopt the institutional approach of waste minimization in the context of campus sustainability, which requires consideration of the multifunction of HEIs by using UTM campus sustainability as a case study
	Motivation <i>What is the motivation of the research?</i>	Waste minimization is at the forefront of campus sustainability initiatives. The campus wide adaptation of waste minimization into Higher Education Institutions (HEIs) however, raises more complex issues rather than an impact to the campus operation per se.

Main Category	Sub Category	Example
Objective of the publication	Research questions <i>What are the Research questions?</i>	<ul style="list-style-type: none"> - “Which drivers and readiness factors motivate higher education institutions to adopt green and sustainable IT solutions?” (Thomson & van Belle, 2014)

Main Category	Sub Category	Sub Category
Methodology	Research design <i>Which research design was used?</i>	<ul style="list-style-type: none"> - Survey - Case study - Case study combined with survey - Case study combined with action research - Action research
	Example: As part of the participatory action research, the authors...	

Main Category	Sub Category	Sub Category
Methodology	Data collection method <i>How did the author collect the data?</i>	<ul style="list-style-type: none"> - Questionnaire - Interview - Observation - Document analysis - Combination of these data collection methods
	<p>Example: ...sampling, measuring and calculating...</p>	

Main Category	Sub Category	Sub Category
Methodology	Data analysis method <i>How did the author analyze the data?</i>	<ul style="list-style-type: none"> - Qualitative, no statistical method - Only descriptive statistics - Inferential statistics
	<p>Example: The analysis of generated waste was conducted by estimating the average, the minimum and maximum masses for each cycle. Using the overall average composition of waste from the previous section, the maximum and minimum amounts of waste according...</p>	

Table 5: Overview research design in relation to data analysis method (review from research work, July 2017)

Data analysis method/ Research design	Descriptive and inferential statistics	Inferential statistics	no comment related to data analysis method	Only descriptive statistics	Qualitative and quantitative (descriptive)	Qualitative, no statistical method	Total sum
Action research			1	1		1	3
Case study		1		4	6	11	22
Case study combined with survey	1	2		1	2		6
Field study					1		1
literatur review					1	3	4
Pilot study		1					1
Survey	3	8		5	7	7	30
Survey combined with content analysis						1	1
Total sum	4	12	1	11	17	23	68

This is preliminary work, please do not cite.



5. Results – Methodology



Table 6: Overview research design in relation to data collection method (review from research work, July 2017)

Data collection method/ Research design	Combination of these data collection methods	Document analysis	Interview	Observation	Questionnaire	Total sum
Action research	1			2		3
Case study	8	4	2	5	3	22
Case study combined with survey	3		1		2	6
Field study			1			1
literatur review	1	2		1		4
Pilot study					1	1
Survey	1		11		18	30
Survey combined with content analysis	1					1
Total sum	15	6	15	8	24	68

(own research.)

This is preliminary work, please do not cite.



5. Results – Methodology



Table 7: Overview data analysis method in relation to data collection method (review from research work, July 2017)

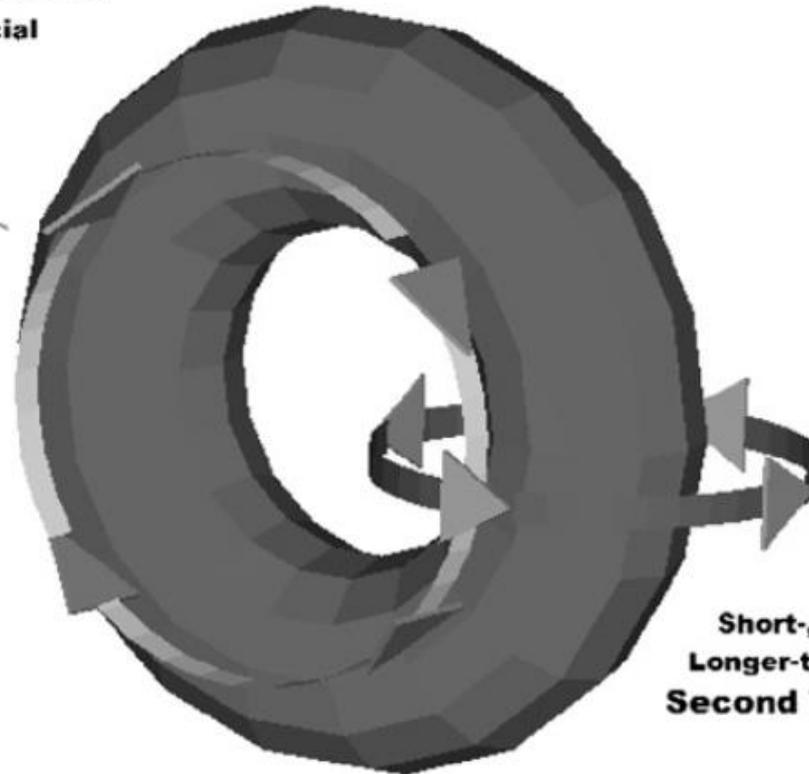
Data collection method/ Data analysis method	Combi- nation of these data collection methods	Document analysis	Interview	Observation	Question- aire	Total sum
Descriptive and inferential statistics	1				3	4
Inferential statistics	1				11	12
no comment related to data analysis method				1		1
Only descriptive statistics		1	2	3	5	11
Qualiative and qantitative (descriptive)	4	1	7	1	4	17
Qualitative, no statistical method	9	4	6	3	1	23
Total sum	15	6	15	8	24	68

(own research.)

This is preliminary work, please do not cite.

First Tier Sustainability Equilibrium

Economic, Environmental, and Social
aspects interactions



Short-, Long- and
Longer-terms interactions
Second Tier Sustainability Equilibrium

Lozano, 2008: 1844

Drei Zitationszweige:

1) Umweltfreundliche Innovation

130 keine direkte Zitationsbeziehung

→ Fragmentierung der Hemmnisforschung

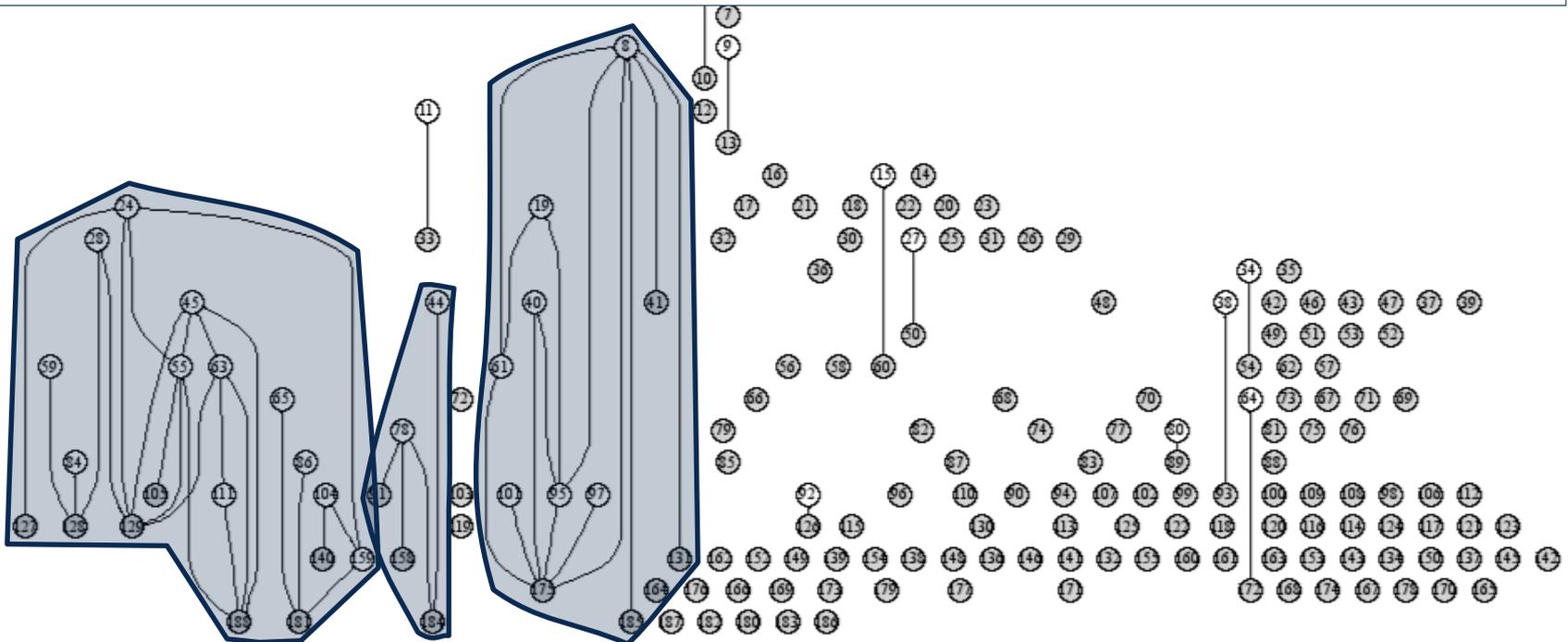
2) Innovation in KMU, Datenbasis (Asien, nationale Innovationsstatistik)

3) Strategieimplementierung

1990

2000

2010



Hueske & Guenther 2015:
136

Sub-category	Number of studies	Exemplary quotes
Customer	36	“Lack of knowledge” (Bala et al. 2008, p. 1617), “customers are not familiar with” (Bazini et al. 2011, p. 6), “lack of consumer concern” (Faisal 2010, p. 181), “Customer reluctance” (González-Torre et al. 2010, p. 896)
Partners	15	“Technological incompetence within trading partners” (Koh et al. 2008, p. 260), “cooperation with other firms” (Tourigny and Le 2004, p. 220)
State	64	“Laws and regulation” (Abdul-Hadi et al. 2005, p. 311), “institutional-related problems stem from taxation practices involving R&D investment, tax credits and capital cost allowances, and from government regulations and standards” (Baldwin and Lin 2002, p. 17), “legal concerns” (Bazini et al. 2011, p. 6), “lack of support and guidance from regulatory authorities” (Mudgal et al. 2010, p. 90), “not yet required by legislation” (van Hemel and Cramer 2002, p. 444)
Society	14	“Lack of public media interest” (Faisal 2010, p. 184), “Societal readiness” (Lam and Mackenzie 2005, p. 74), “community concerns” (Post and Altman 1994, p. 77)

Sub-category	Number of studies	Exemplary quotes
Strategy	105	<p>“Lack of clear business strategies” (Al-Allak 2010, p. 93), “missing long-term corporate strategy” (Antlová 2009, p. 151), “unclear goals” (Fard et al. 2011, p. 390), “Inaccuracies in strategic business planning” (Ali and Hadi 2012, p. 267), “No clear DBM strategy” (Fletcher and Wright 1995, p. 120), “Poor or vague strategy” (Hrebiniak 2006, p. 17), “lack of prioritization” (Ren 2009, p. 296)</p>
Structure	121	<p>“Bureaucratic resistance” (Borins 2000, p. 61), “Inappropriate organizational structure” (Fard et al. 2011, p. 397), “inability to specify performance measurement” (Fard et al. 2011, p. 397), “Inconsistency with existing internal processes, rules and regulations” (Loukis et al. 2011, p. 139)</p>
Size	11	<p>“Firm size” (Johnson 2010, p. 169), “scale of operation is too small” (Herath 2010, p. 271), “the older, larger, and more successful organizations become, the more likely they are to have a large repertoire of structures and systems which discourage innovation” (Salaman and Storey 2002, p. 161)</p>

Hueske & Guenther (2015): 131

Sub-category	Number of studies	Exemplary quotes
Resources	157	“Lack of resources and resource allocation” (e.g. Fard et al. 2011), “lack of resources, including time, access to research articles and funding” (Manuel et al. 2009, p. 621) “lacked the necessary financial resources” (Geri and Ahituv 2008, p. 355), “inadequate funding” (McGaughey and Roach 1997, p. 258), “Lack of time and resources” (Evangelista et al. 2010, p. 40), “Insufficient people” (Duh et al. 2006, p. 946), “shortage of personnel” (Mohnen et al. 2008, p. 204)
Organizational culture	38	“Organizational culture incompatible” (Ali and Hadi 2012, p. 267)
Organizational learning	44	lack of training (e.g. Arevalo and Aravind 2011; Chadha and Kapoor 2010; Delgado-Ceballos et al. 2012; Magd 2010), learning difficulties (Cicmil 1999; Heide et al. 2002)

Hueske & Guenther (2015): 131

Sub-category	Number of studies	Exemplary quotes
Team structure	6	“Team too large” (Antony et al. 2008, p. 486), groups are not permanently anchored in the organizational structure: “No permanent IS planning group” (Lederer and Sethi 1992, p. 79)
Team climate	9	“Work units trying to outdo one another, making passing off hard cases” (Tan and Heracleous 2001, p. 371), “team members protecting their interests” (Sedmak 2010, p. 8)
Team processes	5	“Lack of effective teams and/or team building skills” (Hoonakker et al. 2010, p. 961)
Members’ characteristics	6	“Different perception [,] different goals” (Kunda and Brooks 2000, p. 720), “Lack of people experienced in earlier implementations” (Jun et al. 2004, p. 164; Kim et al. 2005, p. 67)
Leadership style	11	“No project leader or champion” (Yauch and Steudel 2002, p. 612)

Hueske & Guenther (2015): 133

Sub-category	Number of studies	Exemplary quotes
Managers' abilities	47	"Lack of experience and knowledge on the part of the managers" (Adams and McNicholas 2007, p. 396), "managers lack capabilities to implement change management" (Čater and Pučko 2010, p. 215), "managers lacking business/training skills" (Simkin 2002, p. 13), "inadequate leadership" (McGaughey and Roach 1997, p. 258)
Managers' attitudes	89	"Lack of management commitment" (e.g. Fard et al. 2011, p. 397), managers' resistance to change (Madrid-Guijarro et al. 2009, p. 476), "hampered by manager's unwillingness" (Salaman and Storey 2002, p. 160), "poor management attitude" (Baldwin and Lin 2002, p. 17)

Hueske & Guenther (2015): 134

Sub-category	Number of studies	Exemplary quotes
Employees' abilities	73	"Workers do not have the necessary skills/education" (Arevalo and Aravind 2011, p. 409), "lack of skilled worker" (Hoonakker et al. 2010, p. 961), "not having the right skills-set to cope with the new technical environment constitutes a crucial issue" (Raus et al. 2009, p. 252), "employees with low abilities" (Seifi and Sazvar 2012, p. 855)
Employees' attitudes	85	"Our employees preferred the old ways of doing business" (Archer et al. 2008, p. 76), "hesitation and unwillingness of some employees" (Loukis et al. 2011, p. 139), "fear of changing the way they do things" (Ngai et al. 2008, p. 230), "key people considered the effort to be useless, believing that the status quo was good enough" (Bhuiyan and Alam 2005, p. 181)

Hueske & Guenther (2015): 134

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