# A Bibliometric Analysis on Theorizing in the Field of Business Information System Engineering

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**Abstract**

Business & Information Systems Engineering is a relatively young academic discipline in the German-speaking area. Its roots can be traced back to the fields of Business Administration, Social Sciences, Applied Computer Science, and Applied Mathematics, thus consisting of two streams of research that are Formal Scientific Research and Engineering. A weakness of the discipline, as Heinrich et al. highlight, is the methodological education of researchers. This paper takes up this challenge and presents a bibliometric analysis of (co-) authors and media in the discipline in the German-speaking area, the main research works, and bibliographic maps, graphs, and tables. The objective of this paper is to shed light on the nature of development – *a contemporaneous state of knowledge in the discipline* – and quantify the processes of written communication. A further aim is to develop an infrastructure for the bibliometric analysis of the bibliographies of the used papers.

**Keywords**

Bibliometric analysis, Business & Information Systems Research, Business Informatics, Information Systems.

## 1 Introduction

Two years ago, the academic discipline of Business Informatics celebrated its 60th anniversary in the German-speaking area (Austria, Germany, Liechtenstein, and Switzerland) (Heinrich, 2012). Although Business Informatics related events, such as the discovery of the »principles of the analytic engine« in 1834 (Charles Babbage), the development of a »technical system for capturing, processing and storing data on punched cards« in 1888 (Hollerith), the emergence of the »brand name« Business Administration in 1898, the development of the first purely »electronic universal computer« in 1942 (Eckert and Mauchly) as well as the first development of a »commercially used computerized information system« in 1949 (by Lyons Food and Catering Company; Lyons Electronic Office) (Heinrich, 2012), can be traced back until the 19th century, compared to other academic disciplines (i.e., mathematics, medicine, etc.), Business Informatics is a young academic discipline.

A milestone in the field of Business Informatics in the German-speaking area was raised in 1993, when representatives of the discipline acknowledged the diversity of the roots of the discipline, especially in Business Administration, Social Sciences, Applied Computer Science, and Applied Mathematics. Additionally, the representatives acknowledged recognizing the Engineering stream and Formal Scientific Research stream within the discipline as having equal status (Heinrich, 2012). Especially the second

agreement can be seen as an agreement between the merger of the German-speaking area-based approach and the Anglo-Saxonian-based approach.

As Heinrich et al. [2] highlights, the approach in the German-speaking area focus more on engineering tasks, whereas the Anglo-Saxonian-based approach (Information System) focuses more on explanation tasks, with the aspiration to augment the discipline with a design theory perspective (Design Science). The approach in the German-speaking area, in this sense, is more technical and has more interfaces to Informatics (i.e., algorithm design, programming, operating systems, etc.). Information Systems aims to investigate application and information systems as well as the interaction between the components of human-machine-task-organization.

However, since then, Business Informatics in the German-speaking area acts as an umbrella term and captures the discipline of Business Informatics on the one hand side and the discipline of (Information) Systems Engineering on the other hand. The discipline therefore should be recognized as an empirical and a theoretical science – and should describe and explain causes and predict consequences.

Efforts to increase the methodological content of research in the discipline in the German-speaking area, as Heinrich et al. [2] highlight, are evident. But, as Heinrich et al. [2] continue, little is being done to improve the theoretical foundation. A reason for this can be the lack of methodological education of researchers (Heinrich, 2005). An initiative to train researchers in this matter is the course »Theory and Theorizing in Information Systems Research« (Mueller, 2021), provided by the German Academic Association for Business Research (VHB). The VHB, founded in 1921, is the oldest platform for scientific exchange and networking for and between scientists, researchers, and scholars in the field of business management/administration and beyond, followed by the Japan Academy of Business Administration and the Academy of Management (United States). The course is designed to build an understanding of what theory and theorizing in the field of Business and Information Systems Engineering (BISE) and Information Systems (IS) is: to understand the state-of-the-art, what role theory plays, to develop basic theorizing skills, as well as to develop strategies to publish theoretical contributions.

The paper at hand contributes with a bibliometric analysis. The recommended papers of the course are used as the origin for a bibliometric analysis (Pritchard, 1969) that address the following questions: »**which (co-) authors and media (i.e., scientific journals and conferences) lead the literature in Business & Information Systems Engineering (BISE) and Information Systems (IS) in the German-speaking area**«, »**what are the main research works in the discipline**«, and »**what are the bibliographic maps, graphs, and tables for the data**«.

The objective of this paper is to shed light on the nature and course of development (Pritchard, 1969) resp. a contemporaneous state of knowledge (Small, 1999) in Business & Information Systems Engineering (BISE) in the German-speaking area and quantifying the processes of written communication (Pritchard, 1969). It aims to contribute to the scholarly landscape from different levels: author level, journal level, decades, etc., to understand the conceptual, epistemological, phenomenological, methodological, intellectual, and social structure of the literature, and to support the scientific community to improve its efficiency and effectivity: to facilitate the understanding of the current situation of research in the discipline (Pritchard, 1969).

In continuation, the further aim of this paper is to develop and test an infrastructure for the bibliometric analysis of the bibliographies of the recommended paper.

This paper is organized into five chapters. Chapter 1 presents the research motivation and the research questions. Chapter 2 presents the research method and chapter 3 presents the research design. Chapter 4 presents the findings of the bibliometric analysis and chapter 5 presents a conclusion and the next steps.

## 2 Research method: literature review based on bibliometric analysis

This paper at hand makes use of bibliometric analysis. Bibliometric analysis can be traced back to Pritchard (Pritchard, 1969) who also defined this research method as the application of quantitative methods (i.e.,

mathematics and statistical methods) to literature (i.e., books, scholarly papers, etc.) and other media of communication (Pritchard, 1969), (Roemer & Borchardt, 2015). Bibliometric analysis, according to Cobo et al. (2011) [9], supports the monitoring of scientific fields and research areas and helps to represent how disciplines, fields, specialties, documents, and/or authors are related. The bibliometric analysis uses, according to Rojas-Sánchez et al. [6], a set of quantitative methods to analyze and evaluate scholarly literature.

By application of bibliometric analysis, the meta-data of scholarly papers and associated metrics get analyzed and evaluated. It investigates the author's oeuvres, documents, and journal's oeuvres and identifies common references among these units of analysis. These metrics, as Roemer & Borchardt [5] highlight, are, for example, Individual Contribution Level Metrics (times cited), Venue-Level Metrics (i.e., impact factor, Immediacy Index, Cited Half-Life, Eigenfactor, and Article Influence Score, SCImago Journal Rankings, Source Normalized Impact per Paper, h5-Index, and h5-Median), Author-Level Metrics (i.e., h-Index and i10-Index), and Institution-Level Metrics (i.e., Essential Science Indicators Rankings, SCImago Institutions Rankings, and Snowball Metrics). The focus of this research is on individual contribution level metrics per paper, author-level metrics per author, and institution-level metrics.

**Table 1: Cooper's taxonomy of Literature Reviews**

| **Characteristics and definition based on Cooper** (Cooper, 1985)**,** (Cooper, 1988) | | **The approach applied in this paper** |
|---|---|---|
| **Focus** | Concerns the material that is of central interest to the reviewer, e.g. on research outcomes, research methods, theories, and practices or applications. | Theories, practices, and applications |
| **Goals** | Goals concern what the author hopes the review will accomplish. The most obvious goal for a review is to integrate and synthesize past literature that is believed to relate to the same issue. | Shed light on the nature and course of development (Pritchard, 1969) resp. provide a contemporaneous state of knowledge (Small, 1999); to quantify the processes of written communication (Pritchard, 1969) |
| **Perspective** | Neutral or dispassionate representation and espousal or advocacy of a position. | Neutral representation; with no or as little personal interpretation and evaluation. |
| **Coverage** | The extent to which reviewers find and include relevant works ..., how reviewers search the literature ..., and how they decide the suitability and quality of material ... | Representative; based on course »Theory and Theorizing in Information Systems Research« (Mueller, 2021) (Discipline: Business Information Systems & Engineering), provided by the German Academic Association for Business Research (VHB) |
| **Organization** | Organization of the paper, e.g. historically, conceptually, and/or methodologically. | Conceptually, historically |
| **Audience** | Reviews can be written for groups of specialized researchers, general researchers, practitioners, policymakers, or the general public. | General researchers and specialized researchers within related fields of Business Informatics |

Source: (Cooper, 1985), (Cooper, 1988)

The bibliometric analysis is augmented with Cooper's (Cooper, 1985), (Cooper, 1988) taxonomy of Literature Reviews. As highlighted in table 1, this taxonomy is composed of six characteristics that categorize reviews according to the focus, goal, perspective, coverage, organization, and audience. The taxonomy, according to Cooper (Cooper, 1985), (Cooper, 1988), can be used as a framework in literature reviewing; it

helps in the assessment of the quality of reviews and allows for a more systematic attempt at distinguishing superior from inferior works.

## 3 Research design

To perform the bibliometric analysis, the following research design has been developed. We got inspired by, for example, Pickering & Byrne [1] and Pickering et al. [12], but decided to develop our design composed of the four main pillars and data set, data clearance, analysis and evaluation, and reporting and presentation.

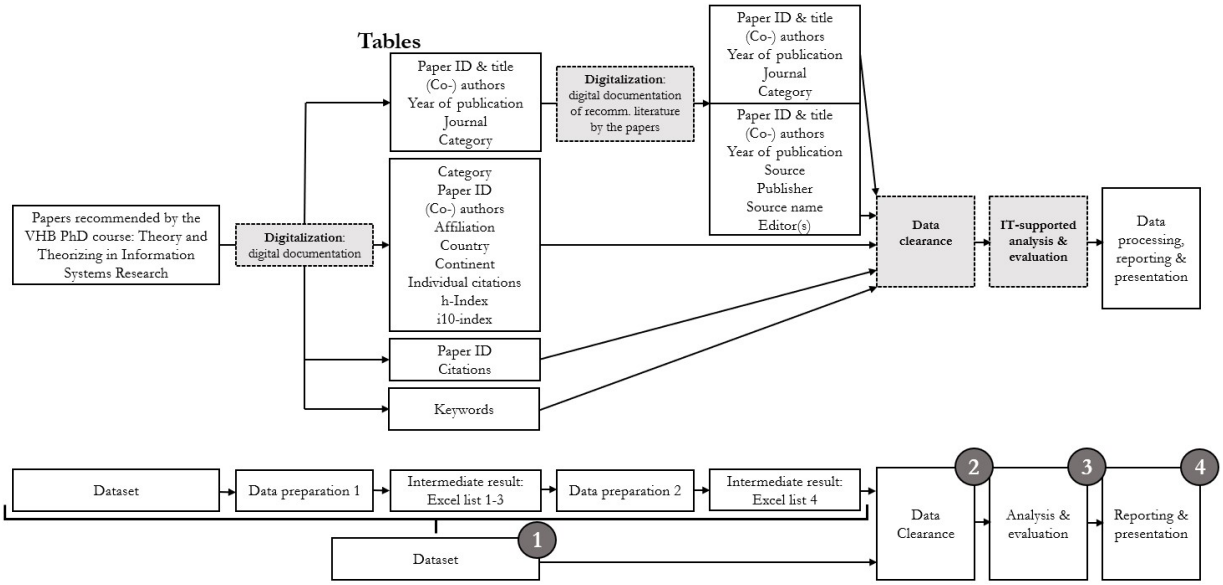


**Figure 1: Research Design**

As depicted in figure 1, the data set (1) of this study is taken from the German Academic Association for Business Research (VHB). In detail, the recommended papers of the VHB course »Theory and Theorizing in Information Systems Research« (Mueller, 2021) (Discipline: Business Information Systems & Engineering) are used as the origin for the meta-data analysis and the bibliographic analysis. This course, conducted in the autumn of 2021, was about the ongoing discussion on theories and theorizing in the Business and Information Systems Engineering and Information Systems (IS) research communities. This course recommends a list of 124 scholarly papers, whereby 107 papers (+ 5 doublets) were used in three modules to teach and discuss the what of theories, the how of theorizing, and strategies for contribution. The course consisted of 16 lectures á 1.5 hours (incl. the opening session and a guest lecture).

First, the 124 papers as well as their bibliographies have been digitized. This digitization resulted in the elaboration of four Microsoft Excel tables about the meta-information, including (co-) author names, affiliations, country, continent, citations, paper title, keywords, publication source, etc. These tables are the basis for the bibliographic analysis at hand.

Secondly, data clearance tasks have been conducted. This step aims to improve the data quality, which again provides the base for better analysis results. This process step included the correction and unification of data, i.e. individual names, such as author names (i.e., Karl E. Weick to Weick, KE; Müller to Mueller, MIS Q to MIS Quarterly, etc.), sources, publication sources, publisher, etc. Additionally, missing information was added, i.e. addition of publication dates, h-index, i10-index, affiliation, country, continent, etc.

In the third step (3), the data experienced a thorough analysis and evaluation. In doing so, the data were examined with the analysis function provided by Microsoft Excel, Standard Query Language (SQL) and R. Excel provides standard functions to analyze data and -*at the same time*- to prepare the data in tables and charts. SQL and R allow to join different data and apply different perspectives on the data. SQL and R allow

to dynamize the analysis and evaluation and shift from a static view of data to dynamic views. Nevertheless, the paper at hand presents the data analysis and evaluation based on Microsoft Excel (Monka et al., 2008). The fourth step (4) is about the preparation of the data, its reporting, and its presentation. In doing so, several methods and tools have been applied, and are presented in the following chapter 4.

**Table 2: Intermediate results overview**

| | **Primary literature** | **Bibliography**[1] |
|---|---|---|
| Sample Size | 107 papers proposed by the VHB, course: Theory and Theorizing in Information Systems | The bibliographies of the papers proposed by the VHB, course: Theory and Theorizing in Information Systems |
| Timespan | 1974-2021 | 1689-2020 |
| Sources | 36 | 1.195 |
| Average cit/doc | 693 | -- |
| Bibliography | 6229 resources | -- |
| (Co-) authors | 215 | 10.650 |
| Unique authors | 203 | 4.952 |
| Authors of single-authored documents | 52 | -- |
| Authors of multi-authored documents | 129 | -- |

The subject of this paper at hand is the analysis and evaluation of the primary literature (c.f. the left-hand side of table 2). The bibliometric analysis and evaluation of the bibliography is progress right now.

## 4 Findings: bibliometric mapping

The sample size consists of 107 scholarly papers. The papers were published in 36 unique sources: mostly scientific journals but also conference proceedings, i.e. the proceedings of the Hawaii International Conference on System Sciences. One paper was published in BISE – the **journal** of the Information Systems community in the German-speaking area. Considered from a discipline-related perspective, the journals belong to the academic fields of management (16 journals + 1 journal in supply chain management), information systems (14 journals), psychology (2 journals), technology, physics, economics, and philosophy (1 journal each).

**Table 3: Intermediate results overview**

| | **Papers published** | | **Impact factor (IF)** | | | |
|---|---|---|---|---|---|---|
| **Journal** | **Absolute** | **Relative** | **IF** | **5year IF** | **Impact score** | **h-index** |
| Academy of Management Review | 24 | 22.43% | 13.865 | 17.311 | 8.54 | 284 |
| Journal of Information Technology | 12 | 11.21% | 5.15 | 8.101 | 4.25 | 82 |
| MIS Quarterly | 11 | 10.28% | -- | -- | 8.55 | 243 |
| Academy of Management Journal | 10 | 9.35% | 10.979 | 16.178 | 10.36 | 336 |
| Journal of the Association for Information Systems | 7 | 6.54% | 5.149 | -- | 5.57 | 85 |
| Communications of the Association for Information Systems | 4 | 3.74% | 2.384 | -- | 2.38 | 53 |
| Journal of Management | 4 | 3.74% | 13.508 | 18.017 | 13.72 | 241 |
| Administrative Science Quarterly | 3 | 2.80% | 12.529 | 14.694 | 12.71 | 191 |
| Journal of Management Studies | 3 | 2.80% | 9.72 | -- | 8.49 | 194 |
| European Journal of Information Systems | 2 | 1.87% | 9.011 | 7.831 | 9.97 | 113 |
| Hawaii International Conference on System Sciences | 2 | 1.87% | -- | -- | 1.7 | -- |
| 25 sources with one publication | 25 | 23.36% | -- | -- | -- | -- |
| Total | 107 | 100.00% | | | | |

As depicted in table 3, the Academy of Management Review published 24 papers out of the sample size, followed by the Journal of Information Technolgy, (12 publications), MIS Quarterly (11), Academy of

[1] Analysis and evaluation in progress

Management Journal (10), and the Journal of the Association for Information Systems (7). These are close to 60% of the papers.

| Year | Absolute | Relative |
|---|---|---|
| 1974 | 1 | 0.93% |
| 1976 | 1 | 0.93% |
| 1986 | 1 | 0.93% |
| 1989 | 5 | 4.67% |
| 1990 | 1 | 0.93% |
| 1994 | 1 | 0.93% |
| 1995 | 3 | 2.80% |
| 1997 | 1 | 0.93% |
| 1998 | 2 | 1.87% |
| 1999 | 4 | 3.74% |
| 2002 | 3 | 2.80% |
| 2003 | 3 | 2.80% |
| 2004 | 3 | 2.80% |
| 2005 | 1 | 0.93% |
| 2006 | 4 | 3.74% |
| 2007 | 7 | 6.54% |
| 2008 | 1 | 0.93% |
| 2009 | 3 | 2.80% |
| 2010 | 2 | 1.87% |
| 2011 | 11 | 10.28% |
| 2012 | 4 | 3.74% |
| 2013 | 4 | 3.74% |
| 2014 | 11 | 10.28% |
| 2015 | 5 | 4.67% |
| 2016 | 2 | 1.87% |
| 2017 | 9 | 8.41% |
| 2018 | 1 | 0.93% |
| 2019 | 7 | 6.54% |
| 2020 | 4 | 3.74% |
| 2021 | 2 | 1.87% |
| Total | 107 | 100.00% |

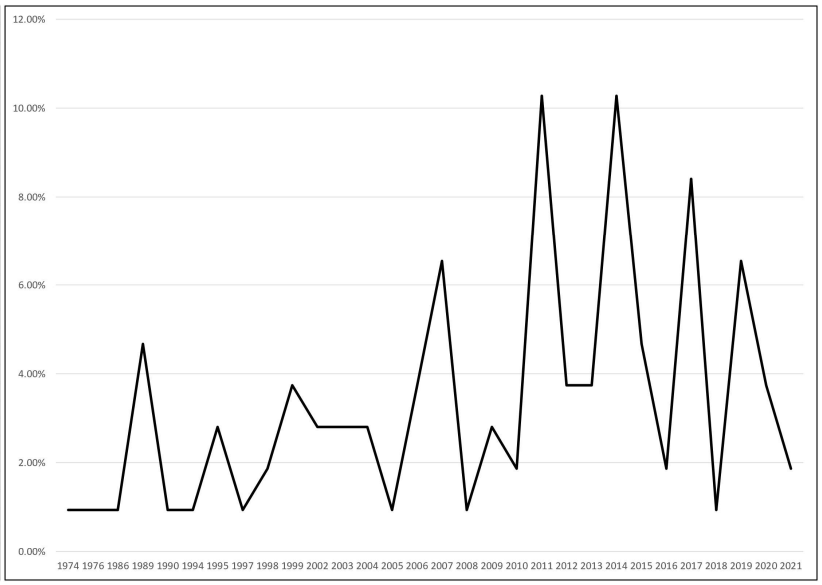


**Figure 2: Year of publication**

The 107 papers have been published between 1974 and 2021 (c.f. figure 2). The most »active« years were 2011 and 2014 wherein 11 papers each got published, followed by 2017 (9), 2007, and 2019 (7 each). The following figure 3 presents the most cited papers. The average citation per paper is 693. 23 papers are above the average score whereas 84 are below the average score.

| | Citations | |
|---|---|---|
| Titel | Abolute | Relative |
| Analyzing the Past to Prepare for the Future: Writing a Literature Review | 11208 | 15.12% |
| Strategies for Theorizing from Process Data | 8082 | 10.90% |
| What Constitutes a Theoretical Contribution? | 5096 | 6.87% |
| THE NATURE OF THEORY IN INFORMATION SYSTEMS | 4317 | 5.82% |
| Organizational Theories: Some Criteria for Evaluation | 3564 | 4.81% |
| Theory Construction as Disciplined Imagination | 3014 | 4.07% |
| What Theory is Not | 2895 | 3.90% |
| Using Paradox to Build Management and Organization Theories | 2407 | 3.25% |
| Levels Issues in Theory Development, Data Collection, and Analysis | 2405 | 3.24% |
| BUILDING THEORY ABOUT THEORY BUILDING: WHAT CONSTITUTES A | 2125 | 2.87% |
| Multiparadigm Perspectives on Theory Building | 2077 | 2.80% |
| 94 papers < 2000 citations | 26946 | 36.35% |
| Total | 74136 | 100.00% |
| Average citation per paper (globally) | 693 | |

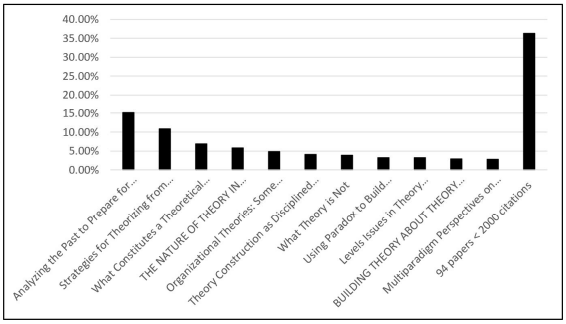


**Figure 3: Most cited papers**

As depicted in figure 3, the most cited paper of the sample size is the paper entitled Analysing the Past to Prepare for the Future: Writing a Literature Review, co-authored by Webster & Watson (2002) [12] and published in MIS Quarterly. As explored in Google Scholar, on the reporting date of 02nd March 2023, this paper was cited 11.208 times, followed by Strategies for Theorizing from Process Data (8.082), What Constitutes a Theoretical Contribution (5.096), and The Nature of Theory in Information Systems (4.317).

| | Appearance in papers | | Actually published papers | |
|---|---|---|---|---|
| Author | Absolute | Relative | Absolut | Relative |
| Mueller | 5 | 2.33% | 5 | 2.46% |
| Gregor | 4 | 1.86% | 4 | 1.97% |
| Hovorka | 4 | 1.86% | 4 | 1.97% |
| Weber, R | 4 | 1.86% | 4 | 1.97% |
| Suddaby | 4 | 1.86% | 3 | 1.48% |
| Avison | 3 | 1.40% | 3 | 1.48% |
| Larsen | 3 | 1.40% | 3 | 1.48% |
| Malaurent | 3 | 1.40% | 3 | 1.48% |
| Rai | 3 | 1.40% | 3 | 1.48% |
| Tsui | 4 | 1.86% | 1 | 0.49% |
| Galliers | 3 | 1.40% | 1 | 0.49% |
| Silverman | 3 | 1.40% | 1 | 0.49% |
| Total: 24 authors á 2 publications | 48 | 22.33% | 44 | 21.67% |
| Total: 124 authors á 1 publication | 124 | 57.67% | 124 | 61.08% |
| Total | 215 | 100.00% | 203 | 100.00% |

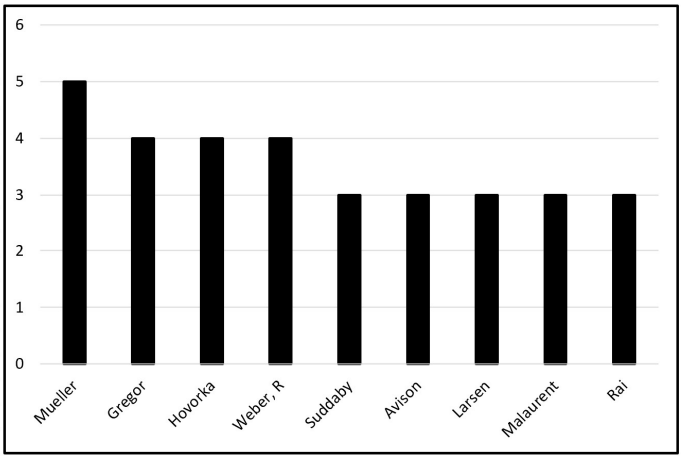


**Figure 4: Co-authors' appearances in the papers**

Due to multiple entries, as presented in figure 4, 215 co-authors could be identified in the 107 papers. For example, Tsui was announced four times in the same paper (Barkema et al., 2015). In the first citation, Tsui is announced as a researcher at the University of Notre Dame, followed by Peking University, Fudan University, and Shanghai Jiao Tong University. After the clearance of these multiple entries, 203 unique co-authors could be identified. Mueller, according to this analysis, contributed to five papers as a unique co-author, followed by Gregor, Hovorka, and Weber, R (four papers each) as well as Suddaby, Avison, Larsen, Malaurent, and Rai (three papers each). Taken together, these authors published 32 papers.

| | Year of publication (most frequent authors) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Total |
| Müller | | | | | | | | | | 1 | | | | 1 | 1 | | | 1 | 1 | 5 |
| Gregor | | | | 1 | | | | | | | | 2 | | | | 1 | | | | 4 |
| Weber, R | 2 | | | | | | | | | 1 | | | | | 1 | | | | | 4 |
| Hovorka | | | | | | | | | | | 1 | | | 1 | | | 1 | 1 | | 4 |
| Avison | | | | | | | | | | | | 2 | | 1 | | | | | | 3 |
| Suddaby | | | | | | | | 1 | 1 | | | | | | 1 | | | | | 3 |
| Larsen | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| Malaurent | | | | | | | | | | | | 2 | | 1 | | | | | | 3 |
| Rai | | | | | | | | | | | | | | | 2 | | 1 | | | 3 |
| Total top authors | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 6 | 0 | 4 | 5 | 1 | 3 | 3 | 2 | 32 |

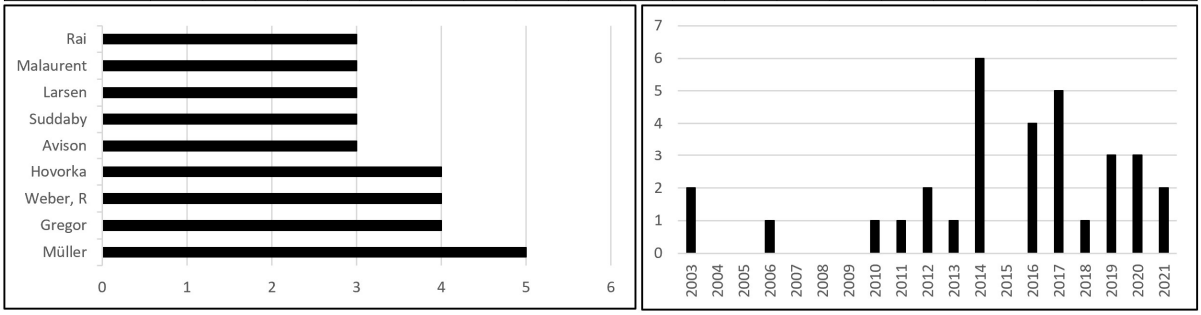


**Figure 5: Most active co-authors according to their appearance in the sample size**

As depicted in figure 5, the majority of the papers of these authors were published in the timeframe between 2010 and 2021 (29 out of 32 papers).

| | Citation | | h-index | | i10-index | |
|---|---|---|---|---|---|---|
| Author | Absolute | Citations | Absolute | h-index | Absolute | i10-index |
| Eisenhardt | 228591 | 6.02% | 84 | 1.18% | 170 | 1.26% |
| Pfeffer | 169811 | 4.47% | 121 | 1.70% | 260 | 1.93% |
| Locke | 162878 | 4.29% | 142 | 1.99% | 290 | 2.15% |
| DiMaggio | 133157 | 3.51% | 83 | 1.16% | 166 | 1.23% |
| Alvesson | 107072 | 2.82% | 155 | 2.17% | 284 | 2.11% |
| Silverman | 103411 | 2.72% | 79 | 1.11% | 206 | 1.53% |
| Shepherd | 70440 | 1.85% | 116 | 1.63% | 253 | 1.88% |
| Luo | 52095 | 1.37% | 108 | 1.51% | 228 | 1.69% |
| Lyytinen | 46334 | 1.22% | 96 | 1.35% | 298 | 2.21% |
| Silvia, PJ | 34503 | 0.91% | 94 | 1.32% | 251 | 1.86% |
| Huston | 21347 | 0.56% | 70 | 0.98% | 375 | 2.78% |
| Average | 24196 | | 45,5 | | 93,7 | |
| Amount of authors | 157 | | 157 | | 144 | |

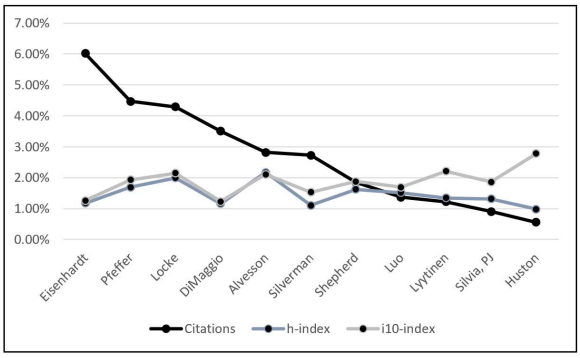


**Figure 6: Comparison of the authors with the highest rank based on citations, h-index, and i-10 index (*due date: 1st March 2023; sort by citations, absolute*)**

From a citation-based perspective, we could identify Eisenhardt as the most representative author. As of the reporting date of 1st March 2023, Eisenhardt was cited 228.591 times, followed by Peffer (169.811), Locke (162.878), DiMaggio (133.157), Alvesson (107.072) and Silverman (103.411) (Source: Google Scholar). Considered from an h-index perspective, we could identify Alvesson with the highest rank (155), followed by Locke (142), Pfeffer, (121), Shepard (116), and Luo (108) (Source: Google Scholar). The h-index is a measure of research performance and corresponds to the maximum number of the author's publications (Richter, 2018). The h-index rewards the assembly-line production of publications with a mediocre response and penalizes authors with few publications but with resounding responses (Tüür-Fröhlich, 2018). From the i10-index perspective of the authors, Huston could be identified with the highest i10-index rank (375), followed by Lyytinen (298), Locke (290), Alvesson (284), Pfeffer (260), and Shepard (253). The i10-index represents papers with at least 10 citations. For example, if an author's i10-index is 28, then this author has 28 publications with ten or more citations (Cornell University Library, 2022).
52 papers out of the sample size are single-authored documents and 55 papers are multi-authored documents (two or more authors per document). Hovorka could be identified as the most active co-author. In total, he collaborated with 17 co-authors, followed by Müller (14), Avison, Malaurent (11 each), Bichler, Fettke, Frank, Krämer, Schnurr, Suhl, and Thalheim (10 each). However, this analysis should be viewed with caution since all of these authors are named in the same paper (Theories in Business and Information Systems Engineering).

| | Appearance in the papers | | Adjusted appearance | |
|---|---|---|---|---|
| Authors' affiliations | Absolute | Relative | Absolute | Relative |
| ESSEC Business School | 7 | 3.26% | 4 | 2.19% |
| MIS Quarterly | 7 | 3.26% | 7 | 3.83% |
| Georgia State University | 6 | 2.79% | 6 | 3.28% |
| Academy of Management Review | 5 | 2.33% | 4 | 2.19% |
| HEC Montreal | 5 | 2.33% | 5 | 2.73% |
| Stanford University | 5 | 2.33% | 4 | 2.19% |
| University of London | 5 | 2.33% | 2 | 1.09% |
| Academy of Management Journal | 4 | 1.86% | 3 | 1.64% |
| Australian National University | 4 | 1.86% | 4 | 2.19% |
| Indiana University | 4 | 1.86% | 4 | 2.19% |
| Pennsylvania State University | 4 | 1.86% | 4 | 2.19% |
| University of Colorado | 4 | 1.86% | 4 | 2.19% |
| University of Sydney | 4 | 1.86% | 3 | 1.64% |

| | Appearance in the papers | | Adjusted appearance | |
|---|---|---|---|---|
| Authors' affiliations | Absolute | Relative | Absolute | Relative |
| Arizona State University | 3 | 1.40% | 2 | 1.09% |
| Bond University | 3 | 1.40% | 1 | 0.55% |
| Journal of International Business Studies | 3 | 1.40% | 1 | 0.55% |
| Journal of Management Studies | 3 | 1.40% | 1 | 0.55% |
| Loughborough University | 3 | 1.40% | 1 | 0.55% |
| University of Auckland | 3 | 1.40% | 2 | 1.09% |
| University of Florida | 3 | 1.40% | 2 | 1.09% |
| University of Maryland | 3 | 1.40% | 3 | 1.64% |
| University of Michigan | 3 | 1.40% | 3 | 1.64% |
| University of Minnesota | 3 | 1.40% | 2 | 1.09% |
| University of Texas (at Dallas or Austin) | 3 | 1.40% | 3 | 1.64% |
| Affiliations with 2 appearances | 46 | 21.40% | 26 | 14.21% |
| Affiliations with 1 appearance | 72 | 33.49% | 82 | 44.81% |
| Total | 215 | 100.00% | 183 | 100.00% |

**Figure 7: Authors' affiliations**

In total, 119 unique affiliations where the co-authors belong could be identified. Without a data adjustment, as shown in figure 7, the ESSEC Business School, and the MIS Quarterly are the most frequently mentioned affiliations. In this perspective, both organizations gained seven nominations and thus would be the leading organizations within the field of Information Systems, followed by Georgia State University (6

nominations), the HEC Montreal, Stanford University, and the University of London (5 nominations each). With an adjustment -the elimination of multiple entries per paper- the most frequently mentioned affiliations are MIS Quarterly (7 nominations), Georgia State University (6), the ESSEC Business School, the HEC Montreal, and Stanford University (4 nominations each).

| | Appearance in the papers | | Adjusted appearance | |
|---|---|---|---|---|
| Authors/country | Absolute | Relative | Absolute | Relative |
| USA | 104 | 48.37% | 104 | 49.52% |
| Australia | 26 | 12.09% | 26 | 12.38% |
| England | 20 | 9.30% | 17 | 8.10% |
| Germany | 14 | 6.51% | 14 | 6.67% |
| Canada | 12 | 5.58% | 12 | 5.71% |
| France | 9 | 4.19% | 9 | 4.29% |
| China | 6 | 2.79% | 4 | 1.90% |
| Finland | 5 | 2.33% | 5 | 2.38% |
| New Zealand | 4 | 1.86% | 4 | 1.90% |
| Sweden | 4 | 1.86% | 4 | 1.90% |
| Netherlands | 3 | 1.40% | 3 | 1.43% |
| Denmark | 2 | 0.93% | 2 | 0.95% |
| Singapore | 2 | 0.93% | 2 | 0.95% |
| Israel | 1 | 0.47% | 1 | 0.48% |
| South Africa | 1 | 0.47% | 1 | 0.48% |
| Spain | 1 | 0.47% | 1 | 0.48% |
| Switzerland | 1 | 0.47% | 1 | 0.48% |
| Total | 215 | 100.00% | 210 | 100.00% |

| | Appearance in the papers | | Adjusted appearance | |
|---|---|---|---|---|
| Authors/continent | Absolute | Relative | Absolute | Relative |
| North America | 116 | 53.95% | 116 | 53.95% |
| Europe | 59 | 27.44% | 56 | 26.05% |
| Australia | 30 | 13.95% | 30 | 13.95% |
| Asia (+Isreal) | 9 | 4.19% | 7 | 3.26% |
| Africa | 1 | 0.47% | 1 | 0.47% |
| Total | 215 | 100.00% | 210 | 97.67% |

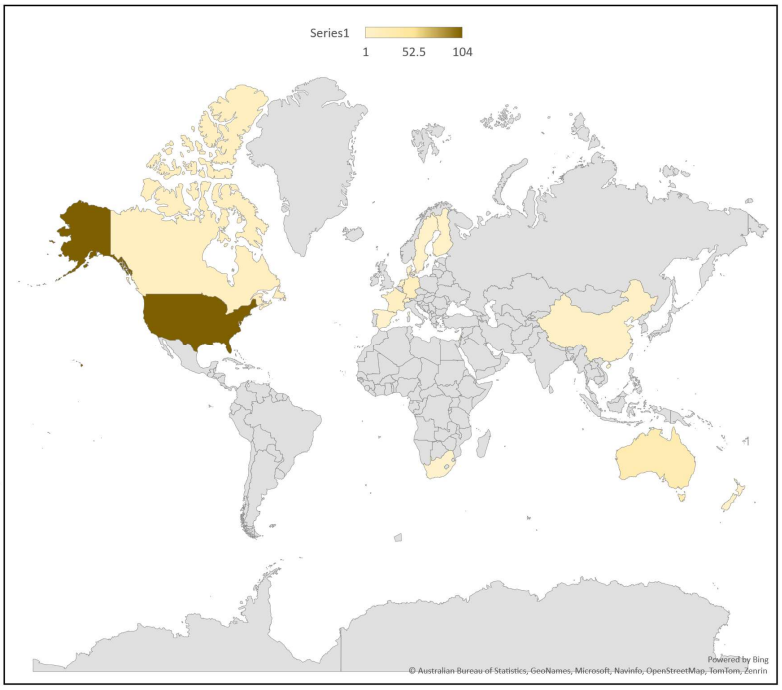


**Figure 8: Authors' affiliations – global presentation**

The authors' affiliations are based around the globe – with a strong emphasis on the Anglo-Saxonian and American countries of the United States, Australia, and Great Britain. Close to 70% of the authors (147belong to an affiliation within these countries (+1 author in South Africa).

| Key Word | Absolute | Relative |
|---|---|---|
| Theory, | 12 | 5.41% |
| Theory Building, | 6 | 2.70% |
| Theory Development, | 6 | 2.70% |
| Literature Review, | 5 | 2.25% |
| Research Methods, | 5 | 2.25% |
| Theorizing, | 4 | 1.80% |
| Construct, | 3 | 1.35% |
| Design Science Research, | 3 | 1.35% |
| IT Artifact, | 3 | 1.35% |
| 15 key words with 2 nominations | 30 | 13.51% |
| 145 key words with 1 nomination | 145 | 65.32% |
| Total | 222 | 100.00% |


**Figure 9: Keywords**

In total, 222 keywords in 42 papers (out of the 107 papers) could be identified. As presented in figure 9, the most frequently announced keyword is »Theory«. It has 14 nominations, followed by »Theory building«, »Theory development (6 nominations each), »Literature Review«, and »Research Methods« (5 nominations each). 15 keywords were nominated two times and 148 keywords one time. The key words experienced a data clearing (i.e., summarizing of unique terms such as »theory« and »theories«) and a clustering process – the grouping of similar and related keywords under one umbrella term.

| Abstraction 1 | Absolute | Relative |
|---|---|---|
| Theory Development & Building | 20 | 9.01% |
| Theory | 13 | 5.86% |
| Information Systems | 12 | 5.41% |
| Literature Review | 10 | 4.50% |
| Epistemology | 9 | 4.05% |
| Research Methods | 12 | 5.41% |
| Design Theory &Science | 8 | 3.60% |
| Construct | 5 | 2.25% |
| ITartifact | 4 | 1.80% |
| Philosophy (ofScience) | 4 | 1.80% |
| Theorizing | 4 | 1.80% |
| Trends in Information Systems & IT | 4 | 1.80% |
| Causal | 3 | 1.35% |
| Grounded Theory | 3 | 1.35% |
| 12 terminologies with 2 nominations | 24 | 10.81% |
| 1x terminologies with 1 nomination | 87 | 39.19% |
| Total | 222 | 100.00% |

| Abstraction 2 | Absolute | Relative |
|---|---|---|
| Research Methods & Design | 82 | 36.94% |
| Theory & Theorizing | 72 | 32.43% |
| Trends & Innovation | 16 | 7.21% |
| Artifact | 14 | 6.31% |
| Authors | 12 | 5.41% |
| Information Systems | 12 | 5.41% |
| Epistemology | 9 | 4.05% |
| Philosophy of Science | 5 | 2.25% |
| Total | 222 | 100.00% |

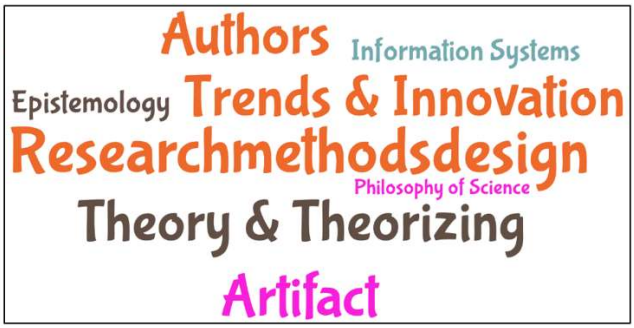


**Figure 10: Keywords (abstracted)**

As depicted in figure 10, the keywords could be assigned to eight »umbrella terms« are »Research Methods & Design« (82 nominations), followed by »Theory & Theorizing« (72), »Trends & Innovation« (16), »Artifact« (14), »Authors« (12), »Information Systems« (12), »Epistemology« (9), and »Philosophy of Science« (3).

## 5 Conclusion and future outlook

This paper at hand presents the results of a bibliometric analysis of the research questions on »which (co-) authors and media (i.e., scientific journals and conferences) lead the literature in Information Systems in the German-speaking area«, »what are the main research works in the discipline«, and »what are the bibliographic maps, graphs, and tables for the data«. In doing so, 107 papers, recommended by the course »Theory and Theorizing in Information Systems Research« (Mueller, 2021), provided by the German Academic Association for Business Research (VHB), have been analyzed. As presented in this paper, the analyzed and evaluated papers have been published in 36 different sources. The timespan of publication ranges from 1974 to 2021. The papers mainly have been published in management-related or information system-related journals. Journals, such as Phil.Soc.Sci. or Journal of Applied Behavior Analysis, are the exception. The Academy of Management Review could be identified as the source with the most publications (24), followed by the Journals of Information Technology (12) and MIS Quarterly (11). One paper was published in the **flagship journal** of the German-language Information Systems: Business & Information Systems Engineering. Two papers have been submitted to and published by the Hawaii International Conference on System Sciences (and its proceedings). In total, 203 unique authors could be identified, whereas Müller (5), Gregor, Hovorka, Weber, R., and Suddaby (4 each) appear most often in the sample size. Considered from an affiliation perspective, seven authors each relate to the ESSEC Business school and MIS Quarterly, followed by the Georgia State University (6), Academy of Management Review, and the HEC Montreal (5 each). Considered from a country/continent perspective, the topic leader is the Anglo-Saxonian and American area, especially the United States of America and Canada (North America), Australia (Australia), and England (Europe). Close to 75% of the papers belong to authors and affiliations located in these areas. The analysis and evaluation presented in this paper at hand are based on Microsoft Excel and capture 107 papers. The next step is to import the papers and their bibliographies into a relational SQL database. SQL increases the dynamics of the analysis and evaluation and allows to combine and join the tables and data more innovatively, i.e.: new combinations, more targeted combinations, etc. Furthermore, additional data can be integrated, such as the course syllabus (the what of theories, the how of theorizing, and strategies for contribution) and its sub-content. In doing so, new knowledge and cognition on the initial research questions emerge. The data set allows a more in-depth analysis of the systems of thoughts in the field of Business and Information Systems Engineering in the German-speaking area.

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