Article

Buzzword – Foreign word – Keyword: The Innovation term in german media

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Abstract

The term "innovation" has been a buzzword in public communication for decades. Between advertising, products and processes, various dimensions run with and against each other. This study is an attempt to develop a more systematic approach to the concept and above all the term of innovation and therefore looks at the german media coverage of innovation. The time period of 20 years and the focus on five leading newspapers and magazines made it possible to obtain a total sample of 127,182 articles, which were investigated through an automated content analysis. This provides a specific view of the context, actors and relationships that have developed around the term of innovation. The specific question is how the term innovation has been used within media coverage over the time span of the last 20 years in Germany and which areas, actors and companies are directly linked to it. The analysis shows that innovation is interpreted as the central currency of economic perspectives, represents a weighty evaluation criterion for politicians and, above all, is used as a permanent evaluation of Germany as a business location in international comparison.

Keywords: Innovation; Innovation Communication; Media; Journalism Studies.

1 Introduction

Economic success has many forms, dimensions and key figures. People enjoy sales growth, reach and stock market value, refer to P/E ratios (relates a company's share price to its earnings per share), employee numbers and balance sheet totals. Another essential factor in the (company's own) evaluation of success is communicated somewhat more subtly. These are references such as those from SAP, Germany's most valuable company (according to stock market value): "For us, innovation means more than just developing new software – it's about developing groundbreaking technologies that set new standards in the IT and business world," reads the company's homepage. Adidas makes a similar promise of success: "The primary goal is to make athletes better. That's why innovation is at the heart of all our products." Innovation as a company-internal organizational unit is promoted by Allianz, which announces: "New Innovation Centers for the areas of assistance, travel and health. These three exemplary statements from three large German companies show the connection between corporate communication and strategic decision-making processes. Innovation is an authoritative category in the evaluation of companies. "The ability to innovate is an elementary characteristic that a company must possess in order to be successful in the long term" (Stark, 2012, p.VII). The degree of innovation is a kind of future perspective: the more innovative, the more promising the entrepreneurial future appears. The interplay of innovation with economic

and social cycles must also be seen (Weis, 2012, p.22): the occurrence of major social disruptions and changes are the basis for completely new business areas, which in turn are shaped along the development lines of innovative ideas. For innovation(s) to be perceived at all, communication about them is often more relevant than the innovation itself. Communicative interaction becomes a condition of innovation. In other words: "Innovations that are not perceived by individual target groups or the public lose their effect as a competitive advantage - for companies as well as for national economies. Communication about innovations assumes an important function as a catalyst and amplifier of processes that can produce or prevent innovations" (Mast, 2015, p.965).

At the same time, this inventory leads to a central research gap: The communication understanding of the actors who work on an innovation and (want to) bring it to public attention has been researched to a rudimentary extent at best (Mast, 2015, p.973). At the same time, it is media publications that bring innovations to public attention in the first place (Dobos, 1988). The terminological and conceptual understanding of innovation (see research gap above) is thus partly taken up and examined even more concretely on the basis of the dimension of journalistic reporting. It can be assumed that journalism, by researching, interacting with audience and selecting topics, forces society's understanding of new things (Wahl-Jorgensen, 2019; Sehl, 2013) and thus plays a key role in the understanding of innovation. This article starts at this point and therefore asks about the term of innovation and its use in the media in Germany. The specific question is how the term innovation has been used within media coverage over the time span of the last 20 years in Germany and which areas, actors and companies are directly linked to it. Specifically, this is done by means of an automated content analysis. For this purpose, all texts from five leading newspapers and magazines in the period from 1999 to 2019 that contain the term innovation were collected. The evaluation of such a dataset provides background information and technical references, as well as an overview of the most important organizations, companies and actors that appear in the context of the term innovation.

2 From Innovatio to Innovation

Across disciplinary boundaries, there is scientific consensus that the concept of innovation can at best be grasped in a rudimentary way and that there is still no functioning systematization, localization or definition that enjoys broad agreement in an interdisciplinary context (Gaubinger, 2009, p.5; Neubauer, 2008, p.7). Based on its origin, innovation from Latin (innovatio) is literally a renewal or change. Nevertheless, there is an extremely long tradition of intensive examination of the term, but also of the connections and practical references to innovation. A comprehensive body of literature has emerged from various disciplines. In almost all publications, Joseph Schumpeter is the historical starting point for this topic. As a "pioneer of innovation research" (Dogruel, 2013, p.41) the economist established the relationship between innovation and the economic system. For years, Schumpeter provided the almost exclusive theoretical framework for all other forms of conceptual, theoretical and transfer-based discussion of the term of innovation. According to his theory, innovation does not emerge from nowhere as a miraculous new phenomenon, but as a "new combination of means of production" (Schumpeter, 1931, p.100). A key development of this basic approach was later created by David Teece, among others. He used the theoretical framework of his predecessors and expressed the importance of dynamic capabilities for organizations more strongly (Teece, 2012). In doing so, he equally opened a bridge between traditional research on innovation and concrete adaptation in the era of accelerated globalization. A clear demarcation from the neoclassical understanding of innovation is the attempt to justify innovation on the basis of evolutionary theory (Dogruel, 2013, p.153). The idea is based on the fact that innovation

as the creation of the new cannot be explained by the existing and that modeling is therefore necessary. More concretely: "A theory of innovation must incorporate explicitly the stochastic evolutionary nature of innovation, and must have considerable room for organizational complexity and diversity" (Nelson and Winter, 1977, p.48). Another break can be seen in the relatively young concept of open innovation (Chesbrough, 2003; Möslein, 2008). Through digital networks and collaborations, the innovation process has long since ceased to be shaped and determined solely within a company. Completely new forms of transfer and cooperation between individual actors and classic corporate structures are emerging. In this concept, creative freedom, the path of implementation and the participation opportunities of many are intended to increase the potential of innovation. Chesbrough (2003, p.43) defines the term as follows: "Open Innovation means that valuable ideas can come from inside or outside the company as well. This approach places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths to market during the Closed Innovation era". This brief and far from complete historical outline provides some key approaches to the term of innovation. In the following, the terminological approach will be further specified.

For this purpose, the OECD's (Organisation for Economic Cooperation and Development) "OSLO Manuel" compiles definitions and forms of innovation in the European economic area in a kind of database. In it, innovation is defined as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations" (OECD, 2018). This results in four dimensions of innovation(s): product, process, marketing, and organizational. Until the 1990s, only product and process innovations were consistently distinguished (Henke et al., 2011, p.27). The emphasis in the OECD definition is on novelty: the innovation must be new at least at the spatial level of a company; larger innovations are then new to an industry or even world firsts. Nightingale (2016, p.1) describes his entry into the definition of the term somewhat differently, seeing it as "an uncertain process that moves from invention to successful commercial exploitation." And further:

> „Innovation is the process that takes an invention, discovery or insight about a new device, process or system to its first successful commercial application. As such it can apply to new products, processes and services, to new markets, to new sources of supply and to new forms of organization.“ (Nightingale, 2016)

In English (and often also in German), innovation is frequently equated or mixed with invention. However, both terms can be clearly distinguished. Invention can be understood as a process within which a new idea is developed and thought through in the first place. Innovation, on the other hand, is to be seen as a multidimensional process (time, place, actions) that runs from the initial idea to successful establishment on the market and is characterized by the constant will to improve (Freeman, 1982, p. 221). In this understanding, the invention is the starting point and the basis for every form of innovation process. Another frequently cited approach to the term comes from Rogers (2003, p.12), who defines innovation as an idea, approach or object that is perceived as new and improved over a previous state. The aspect of implementation, in turn, spans the gap between idea and innovation: Only when actual and real availability is given does the idea become an innovation with an option for consumption. This circular process is at the core of global innovation efforts. In this context, Passoth and Rammert (2016, p.45) speak of an "expansive drive of economic innovations" and diagnose a "general innovation imperative for all areas of society". From this relatively broad approach to the term, different expressions (e.g. technical aspect) can be added and specified. Another key dimension of innovation concerns intensity, i.e., the immediate strength and consequent impact of an innovation. Three main forms

have become established here in science and practice:

- **Incremental Innovations:** They are often subsumed under the catchword continuous innovation and refer to innovation results that have been achieved by a rather simple further development of already existing products or processes (Bruns, 2014, p.14; Fröhlich, 2010, p.163). They are usually a kind of new combination of existing and added elements and thus a gentle form of further development.
- **Breakthrough Innovations:** It goes a step further and allows for competition-based advancement. Breakthrough innovations can displace established products from the market, which leads to new technological trajectories and paradigms" (Ahuja and Novelli, 2016, p.753). By this, breakthrough innovations can replace existing technologies and open up new opportunities and tasks for companies and customers.
- **Radical Innovations:** A clear paradigm shift represents the most impactful form of innovation. Dosi (1982) sees two essential factors for such developments: Deficiencies in what already exists and the search for improvements, as well as scientific and, in particular, natural scientific discoveries, which subsequently leads to a chain reaction and transfer to the economy and society. Thus, it is almost always a technical innovation that triggers a radical change that alters large parts of human organization or coexistence. Madsen and Szyliowicz (2016, p.726) specify: "A radically new technology involves a shift in a product or process that fundamentally increases the value created by the product or process and/or lowers the costs incurred to create that value."

These dimensions address definitional aspects, complement the approach to innovation, and at the same time serve as a bridge to innovation communication.

2.1 From Innovation to Innovation Communication

This brief summary of selected definitional approaches is supplemented in the following with the communicative character. Compared to the traditional lines of research on innovation (see above), which were significantly influenced by Joseph Schumpeter (Schumpeter, 1934; 1939), the line of research on Innovation Communication is relatively young. With respect to the German research landscape, the publications by Mast and Zerfaß (2005) and Mast et al. (2006) created the basic theoretical localizations. Subsequently, several empirical works emerged, strongly characterized by a mesoperspective view on the question of how innovations are mediated and discussed in the media. This includes the central question of how innovations are portrayed in the media and how the interplay between strategic corporate communication and journalistic perspectives can be described more precisely in the context of innovation reporting (Huck, 2009). In the context of this line of research, the definition of Innovation Communication that is still in use today also emerged. According to Zerfaß and Huck (2007, p.848), we understand this to mean

> "the systematically planned, executed, and evaluated communicative communication of new products, services, technologies, processes, concepts, and ideas with the goal of creating understanding of and trust in the innovation and positioning the organization behind it as an innovator."

Seen in this light, Innovation Communication represents an impulse to stakeholders and profitably attempts to describe and explain innovations and gradually build trust. Through communicative support, it becomes part of the image building of organizations (Sun et al., 2017, p.168; Mast, 2015, p.970). Leeuwis and Aarts (2011, p.21) argue that "innovation is a collective process that involves the contextual re-ordering of relations in multiple social networks". Innovation communication should position the respective organizations on the market, strengthen the brand, and thus create additional value on various levels (Weber and Grauer, 2019; Nelke, 2019, p.84).

However, the positioning of Innovation Communication must be seen in a broader context: The term, the content, and the processes are far more than pure PR-Products, science communication, or reporting on technology (Zerfaß and Huck, 2007, p.848). Although these facets play a weighty role, Innovation Communication nevertheless needs a broader framework, which in turn also raises further questions about its scientific location. Rademacher (2005, p.136) argued in an early discussion that Innovation Communication should be understood as a concept rather than a discipline. Thus, Innovation Communication becomes a research field, which in turn becomes a research topic. Zerfaß (2009, p.41) states in the context of interpretation and task diversity as design: "Innovation Communication must be designed situationally and, according to the different contexts of action and process phases, act both adaptively and structurally". The theories and backgrounds of the processes of "public opinion formation" (Bentele et al., 2003) are therefore indispensable as a basis for understanding how Innovation Communication is structured, carried out and affects the audience. The planning, implementation and retrospective evaluation of such processes thus requires listening, strategic integration of various stakeholders and the ability to identify relevant publics and stakeholders in the first place (Zerfaß, 2009, p.41).

In this network of preconditions, strategies and effects, Innovation Communication has often been understood and analytically observed as a "strategic field of action" (Zerfaß et al., 2004). Under the concept of fields of action, the idea has been taken up interdisciplinarily from pedagogy that different subfields and disciplines can interact and be linked at the interfaces of problems (Nohl, 2019, p.147). The field of action of Innovation Communication seeks, structures and deals with the central question of how innovations can be planned, implemented and explained from a communication science perspective. The first approaches to Innovation Communication (2004-2007) focused primarily on the problem and the question of how innovations are communicated in concrete terms. With the expansion of the idea of communication management (Zerfaß and Huck, 2007), new dimensions and theoretical approaches were opened up for the research field. The levels of investigation of Innovation Communication (Mast, 2015, p.967) have thus become more multilayered. More concretely, this means that at the macro level, Innovation Communication networks separate subsectors of society and promotes their networking. At the meso level, the sum of internal and external communication processes in companies can be described. From a micro perspective, we can ask how people react to innovation and how they themselves participate in these processes. These three levels intertwine and influence each other. In view of these interdependencies, the "strategic field of action" becomes extremely complex when viewed in detail; it involves a multitude of actors in the process.

2.2 Three levels of Innovation Communication

In the following, Innovation Communication is understood as the sum of all communicative exchange processes about innovation(s) and can be differentiated on the basis of various levels. A distinction can be made here:

- *Innovation Communication as an instrument of corporate communication:* In terms of brand positioning, innovation is communicated to the outside world as a core component of corporate strategy and actions. Zerfaß (2005, p.32) distinguishes between three different sub-dimensions. Internal Innovation Communication structures the actors involved in an innovation process (1), innovation marketing concerns the targeted advertising of a company's own products and processes to stakeholders (2), and innovation public relations (3) targets stakeholders with whom no direct business relationships are conducted, but whose position in government and society makes them important nodes in the establishment and placement of innovations (politics, the judiciary, critics, authorities). Innovation Communication as an instrument of

corporate communication pursues the goal of building trust and reinforcing credibility.

- *Innovation Communication as the content of interpersonal communication:* By inference, every form of communication among people is the basic prerequisite for our existence and personal identity (Höflich, 2005, p.69). It is thus the "prototype of all social interaction" (Berger and Luckmann, 1970, p.31) and thus also a kind of template for media communication. Based on the fact that interpersonal communication is communication between people, communication about innovation is a part of interpersonal interaction. In the present context, a distinction can be made between:
  a) Process-based Innovation Communication as a form of internal corporate communication that arises around innovation processes and represents a success dimension (Blumenfeld and Gillenberg, 2007, p.13).
  b) Consumption-based innovation communication as a form of interpersonal communication that is detached from professional tasks on the basis of possible consumer spending in the private sphere, e.g. on the question of which car should be purchased and what experiences have been made with it (communicated personally and/or through the media) in terms of price, equipment or innovation level.
- *Innovation Communication as the subject of media coverage:* Innovation Communication as corporate or interpersonal communication is carried into society via media coverage and positioned there for follow-up discussions. In terms of a normative understanding, journalism researches, selects and presents content that is relevant to an audience (Meier, 2018, p.13). Innovations as a degree of economic performance or individual improvements on the product or process level represent such relevance, depending on the audience. Journalism researches backgrounds, classifies and explains these developments in a comprehensible way, possibly drawing on corporate communication content and/or in turn creating impulses for interpersonal communication about innovation(s) through reporting.

In this way, the combination of these three levels of Innovation Communication is simultaneously a cycle model that permanently generates new impulses and thus keeps the topic of innovation present in the public sphere. With the help of this theo-retical template, concrete empirical insights gained from media coverage of the topic of innovation will be linked in the following. Specifically, the following guiding questions arise:

- How can the german media coverage of the topic of innovation be described over the last 20 years?
- Which actors and companies appear particularly frequently in the context of the term of innovation, and what relationships can be observed?
- Which references and dependencies arise around the term of innovation?
- Is the (extensive) reporting on innovation and innovation characterized by certain temporal rhythms or has it remained quantitatively constant in recent years?
- Are there differences between the selected leading media along these research questions?

3   Methodology

The first question to be addressed is the material to be used for the study. Therefore, five leading german media were initially selected, which at least to some extent cover media reporting in German-speaking countries. Krüger (2013, p.97) describes leading media as based on their primary function as a source of information for the audience, but especially for other media. They therefore have an increased influence on the formation of public opinion. Leading media are not necessarily dependent on a high direct reach. Because it can be assumed in the present case (and also with a

view to the scientific stocktaking) that reporting on innovation(s) is primarily shaped by business and politics, leading media were selected that have a clear focus on these departments in their own presentation. In addition, print editions were explicitly used and no online versions. The former, as completed products, are clearly assigned to a date, an issue and a page number, and cannot be changed after publication. The following media are therefore available as study material for the automated content analysis:

Süddeutsche Zeitung (SZ), Frankfurter Allgemeine Zeitung (FAZ), Handelsblatt (HB), DIE WELT and DER SPIEGEL.

These leading media have different accesses, periodicity and are regularly cited in the context of politics and business. They therefore represent a reasonable sample for the research project. Of course, any form of deliberate sample selection is prone to weaknesses. In the present case, too, it could be argued that magazines such as *CAPITAL* or *MANAGER MAGAZIN* with a focus on business can be regarded as leading media. Such decisions are part of any analysis. In the present case, media were explicitly selected that do not count as purely business publications but offer a broad range of topics so that the term of innovation appears in as many contexts as possible (e.g., politics, sports, culture). The focus on business magazines, on the other hand, would have served almost exclusively the economic perspective.

The great strength of the automated access lies in the processing capacity. Therefore, the largest possible time period was selected: Via the respective individual archives as well as via the databases *Nexis* and *Wiso*, the largest common time frame of all selected media reaches back to the year 1999. The time span was thus set to 1999-2019. The word field Innovat* was then used as a search and pick-up criterion for individual articles (analysis units) via the search function. Thus, the search returns texts that use at least once one of the terms "innovation", "innovations", "(more)innovativ", "innovation capability", "innovation-friendly", "innovation-hostile", "innovation power", "innovation communication", and so on. The hits of the five leading media were subsequently downloaded bundled and distributed in five single packages (all articles of a medium in one file). At the same time, a simple mask was created using the statistical program *SPSS*. Here the date, medium, number of articles found and the respective articles per year were recorded. This compilation allows the analysis of the question how the temporal rhythms of the reporting on innovation(s) can be described in more detail, at least on the basis of the number of articles. More detailed and classically automated analyses are then provided by the options of the open source software *RStudio*. First, we understand automated content analysis to be a form of text analysis "in which part of the analysis of text data is performed automatically by machines. It [automated content analysis] is partially automated, since in many procedures [...] manual coding [...] continues to play a role" (Boczek and Hase, 2020, p.119).

For the analysis, the five article packages of the selected newspapers and magazines were fed into *RStudio*. Data cleaning was performed using the typical procedure for automated analyses (Wilkerson and Casas, 2017). With the help of this procedure, a total number of 127,182 articles was created. This is where the great advantage of automated content analysis becomes apparent: This data basis would be about 180,000 pages thick if printed out in regular form and could only be analyzed in its entirety by large research groups after years of work using a codebook.

4 Results of the automated content analysis

First, the pure frequency of articles with an innovation reference (search term "innovat*") is mirrored on the time axis from 1999-2019. Here, we first see that the pure use of the term and its variations in the selected leading media is significantly lower in the present than it was a few
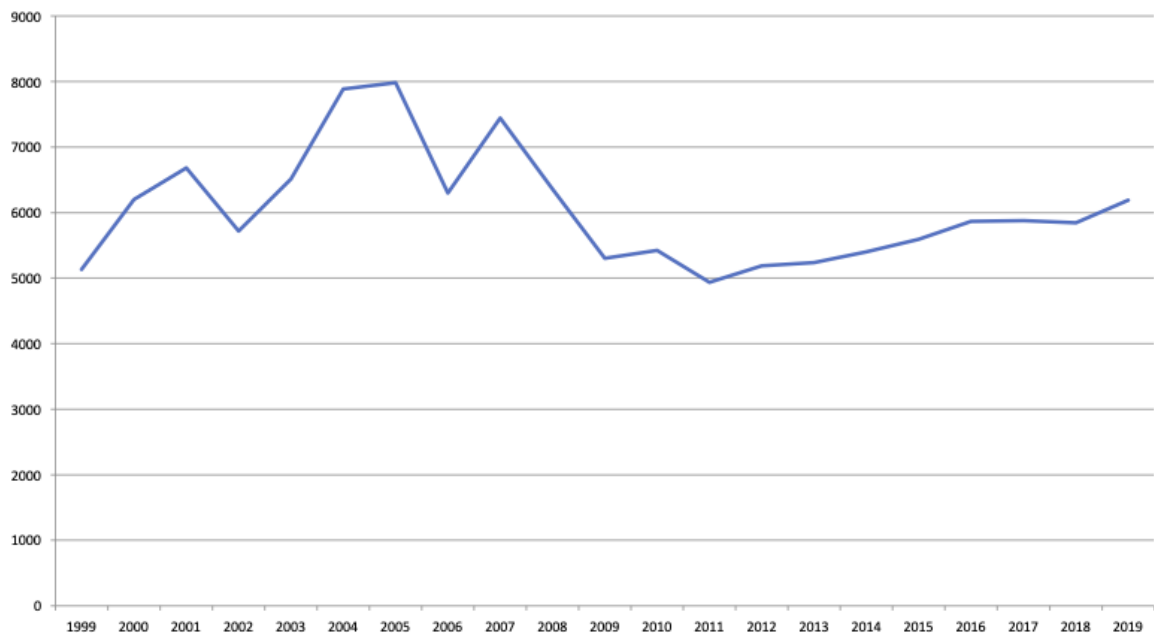
Figure 1. Articles with Innovation-reference in german media SZ, FAZ, WELT, SPIEGEL and Handelsblatt between 1999-2019.

years ago. At the same time, it must be mentioned that the average total volume of the leading media has decreased in this time period.

The peak of this curve is in 2004 (7885 articles) and 2005 (7982 articles). A clear political reference can also be identified here: The then Chancellor Gerhard Schröder (social democratic party, SPD) had repeatedly chosen 2004 as the German "Year of Innovation" in several initiatives. This direct reference can be found in numerous texts from these years, partly critical, partly as a neutral reference, partly as praise for the fundamental willingness to reform. As a result, significantly fewer articles with a reference to innovation were found across the five leading media. The total numbers dropped to 5302 (2009) and to the lowest point of 4936 articles in 2011. Since then, the frequencies have been rising slightly but steadily, with 6191 articles related to innovation identified in 2019. This compilation based on five selected leading media thus contradicts the hypothesis that innovations and reporting on them are exclusively a trend of the digital present. Rather, the pure frequency of the word field around innovation has been consistently high for years, but the extremes of the years 2004 and 2005 were by far no longer reached in the following on the basis of this sample.

In the next step, the pure frequency of reporting on innovation topics is supplemented with more content-related components. First, the question arises as to which actors from politics, business and society are associated with innovation(s). Here, more details can be obtained from the material by means of so-called KWIC calculations. KWIC stands for "Keywords in Context", which means that keywords are searched for that occur particularly frequently in the context of a topic (in this case, innovation). The results in the categories people, company and topic field are shown in the table (Figure 2).

The compilation first shows the strong political dimension of innovation: By a clear margin, political elites are the people who appear most frequently in the context of innovation. This makes it clear that a country's innovativeness, innovative strength and willingness to innovate is a key evaluation unit for the work and success of a government. If we look at the list of the 15

people who appear most frequently in the context of innovation, only two of them are unrelated to politics: former Daimler CEO Dieter Zetsche and economics professor Andreas Pinkwart. Although the latter was a state minister, he very rarely appeared in his political function in the reporting. The following findings refer to several or specific excerpts from texts in the leading media. The citation is therefore based on the respective issues of the leading media (e.g. SPIEGEL 44/2010).

	Persons	Companies	Topics
1.	Angela Merkel	Siemens	Economy
2.	Gerhard Schröder	Google	Politics
3.	Donald Trump	Apple	Feuilleton
4.	Barack Obama	BMW	Cars/Mobility
5.	Sigmar Gabriel	Microsoft	Technology/Science

Figure 2. Most frequent named Persons, Companies and Topics in context of innovation(s) between 1999-2019.

When looking at the companies, the US-Tech-Giants dominate, even though Siemens appears even more frequently in the context of innovation in the overall accounts. Siemens operates worldwide and is extremely popular as a stock investment in Germany. In recent years, the corporation has demonstrated (also visible in its reporting) significantly increased interest in the new business areas of artificial intelligence (AI), additive manufacturing and cybersecurity: "At the future Siemens AG, the main focus will be on innovations" (Handelsblatt 9/2019). In every selected leading medium, Apple, the world's most valuable company (in terms of stock market value) for a long time, was similarly frequently noted in the context of innovation. New Apple products and their aggressive presentation and marketing have been part of media coverage for years. From an innovation perspective, a cursory glance at the articles reveals that Apple has long since ceased to be perceived as an exclusive supplier of devices such as smartphones, PCs or tablets (SPIEGEL 13/2019). The U.S. company has successfully presented itself in the cloud and streaming market and converts large parts of its balance sheets here or invests large sums in research and development at these interfaces. In addition to Apple, two other U.S. companies, Microsoft and Google, have appeared very frequently in the context of innovation. Often, references to these companies can only be found on an exemplary level in the texts. In the innovation context, insertions such as "large companies like Google and Apple benefit from..." then emerge. Direct insights into the business, strategies and balance sheets (apart from new Apple products) are rather rare in the reporting. Instead, these three companies mentioned often stand as a reduced example level for the structure, power and potential of the large companies that dominate the world market in the field of software, devices and applications. Medium-sized companies or smaller entrepreneurs appear only in very rare cases.

These findings also fit in with the results for the thematic areas of innovation. Depending on the bundling of departments/topics, nearly 70 percent of the units of analysis are allotted to the topic area of business. Politics and feature pages follow at a considerable distance, as do the fields of automobiles/mobility and technology/science. However, it is difficult to make a meaningful distinction between the topics of business and automobiles/mobility. The economy (in Germany) is significantly influenced by the automotive industry and its suppliers, and the same applies to the presentation of innovations in Germany (Handelsblatt 6/2019). The topics of (e-)mobility, artificial intelligence and energy are the central themes in recent reporting (2015-2019).

With the help of more detailed text analysis from recent years, certain reporting patterns and focal points can be identified along the individual leading media. Politics as a framework and department plays a particularly important role in the innovation sections of *FAZ* and *SZ*. Here, the framework conditions, subsidies and interactions with the economic system are processed, analyzed and criticized more intensively. The *Handelsblatt*'s departmental assignments are somewhat more differentiated. As a business newspaper, the individual characteristics are more precisely differentiated here, and innovation is very clearly identified as a central task of good management in this sample. These are followed by the areas of automobiles/mobility, software and investments, with much smaller intervals between them than in the other media. The latter in particular provides another interesting link to the topic of innovation. Innovation and innovation potential are important drivers in the valuation of companies. Investors and small investors on the stock market expect innovation to lead to increased sales and thus to associated returns in the case of an investment (SPIEGEL 21/2019). The topic-centered coding at *SPIEGEL* and *WELT* shows a clear reference to technology - and closely linked to it - to media and communication. Here, the focus is primarily on aspects of digitization and innovative forms of human-human, human-computer and computer-computer interactions. Especially under the catchword of artificial intelligence (AI), numerous articles on this topic have appeared across all leading media, especially in recent years (FAZ 9/2019, FAZ 11/2019, Handelsblatt 6/2019, SPIEGEL 5/2019, SPIEGEL 6/2019). In addition to products and entertainment (here particularly frequently recorded as technology innovations), the topic of automobiles/mobility is also very present here.

In addition to pure frequencies, references to actors, topics and companies, further details can be determined from the context of reporting on innovation. Here, the function FCM (Fuzzy C-Means) offers itself via *RStudio*. FCM can analyze clusters from a vector, data frame or matrix, record them and, if required, display them graphically with further applications. For the case at hand, this means: With the help of the FCM function, the data set of all leading media can provide more precise conclusions about the immediate context of the search term (innovat*) and thus complement the previous findings. The results are the 30 following words that appear most frequently in the immediate vicinity of the search term (this included):

[1] "innovations" "company" "innovation" "more" "germany"
[6] "new" "says" "start" "europe" "percent"
[11] "must" "years" "innovative" "be" "always"
[16] "euro" "many" "in the process" "gives" "new"
[21] "about" "china" "since" "ups" "already"
[26] "year" "market" "digitalization" "good" "german"

Innovations, company, innovation, more and Germany are the most frequent five words in the context of this analysis function. The strong focus on the basis of the economy and companies is thus confirmed once again on the basis of this specification. The central demand and/or promise of "more innovation(s)" is also a very frequent component of media coverage of innovation. In the second and third rows (rankings 6-15), references to "new" (dimension of innovation), "percent" (measurability of success or impact) and Europe (as an economic and geopolitical reference) can be glimpsed. At the same time, a closer look at the units of analysis reveals that the term innovation is almost universally used as a buzzword without deeper definition or systematization. This pure listing shows various references, including a strong focus on China, start-ups (is visible separately here in rankings 8 and 24 due to the mostly coupled notation) or digitalisation. Again, only the pure frequency is the central finding of the automated approach.

In the next step, further dimensions can be shown with the help of word analyses. Here, too, the central terms innovation(s), more, companies, new and Germany are logically in focus.

It is interesting to note that in this automated evaluation, it is the companies, and not the innovation-term itself, that is at the center of the connections. For a better overview, all forms of filler words, pronouns and (locative) adverbs have been excluded here. All around, the other references are shown somewhat more clearly, but not in relation to each other. It is precisely this weakness that can be at least partially mitigated with another feature in *RStudio*: More details about the concrete relation of the loose terms can be obtained with the network function. Here the terms are systematized according to direct relation (proximity to each other in the text) on the basis of a net (Figure 3).
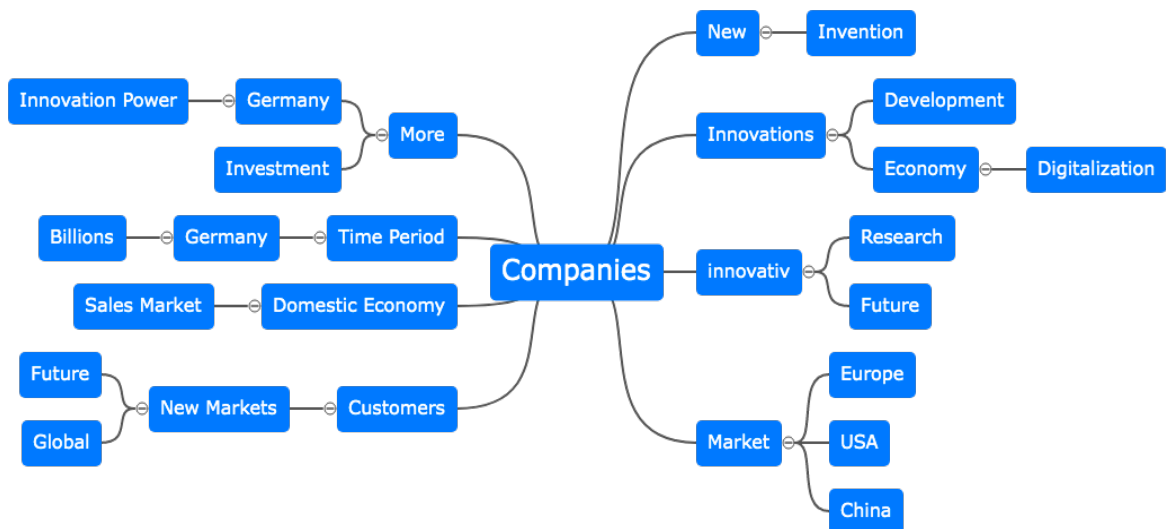
Figure 3. Wordnet around „Innovat*" in german media (1999-2019)

The respective frequency indicates the intensity and range (distances to each other) to be considered in the network. The core of the network is formed by (see also list of most frequent words) companies, innovation, innovations, and more. These words are thus intensively and directly linked to each other in sentence constructs across all texts. On the left edge, there is a clear connection between the fields of start-ups (new markets) and digitization, which also form their own clusters in the context of innovation and are often part of the reporting on them. On another path the time reference becomes clearer: future, digital, research and development are central components of this cluster. The economic environment is clustered on the right edge. Here, strong references between Germany's market positions and the global powers USA and China can be seen. In addition, countable gradations (percent, euro, billion, years/years) play an important role in the journalistic classification of these topics. Each of these approaches from the functions of *RStudio* has its own approach, strengths and weaknesses. Nevertheless, the overall approach of using an automated content analysis to work out initial references and content components of the reporting of German leading media on innovation has yielded important insights. Above all, the step-by-step approach to the content complemented each other to form a comprehensible overall picture. The sample of 127,182 articles from the period 1999-2019 represents an extremely broad spectrum and can thus be regarded as a useful basis for the analysis of the media portrayal of innovation. For the follow-up research, this means that even more details and backgrounds could be worked out with a subsequent qualitative evaluation.

One step in this direction is a small case study that comes directly from the material. For this purpose, the theoretical cycle model of innovation communication (see chapter 2.2) is taken up. This shows a multi-stage development of a topic in the context of innovation, which is

shaped by corporate, interpersonal and media/journalistic communication. This systematization is initially an abstract compilation of various concepts of innovation communication. It can be better understood by linking the model to a concrete topic from the data set. The topic of AI serves as an example for this. It is clearly positioned as a central challenge for innovation management in the present and the future. Communication about AI as a challenge for companies and society can be integrated more concretely using the three levels:

- *Innovation Communication as an instrument of corporate communication:* In terms of brand positioning, innovation is communicated to the outside world as a core component of corporate strategy and actions. A look at the data material shows many examples here: FC Bayern and other major sports clubs work with AI products and communicate this as a completely new form of efficient training control (SZ 10/2020). A startup from Germany boasts of using AI for data organization and analysis or transactional tools for virtual data rooms (Handelsblatt 6/2019). Adidas uses AI and thus data analysis with Alteryx to not only sort through data from the past. Rather, it also derives projections into the future from these insights (SZ 5/2019). The original source of this information is in each case the company itself; the media mentioned pick up on these publications.

- *Innovation Communication as the content of interpersonal communication:* By inference, every form of communication among people is the basic prerequisite for our existence and personal identity (Höflich, 2005, p.69). It is thus the "prototype of all social interaction" (Berger and Luckmann, 1970, p.31). Consequently, it can be assumed that publications around AI projects of major brands will be taken up as a topic of interpersonal communication. In contrast to public communication, this assumption cannot be measured directly by content analysis. But there are studies that at least show that the topic of AI is also gaining relevance for each individual at the micro level. A Bitkom study of just over 1,000 people surveyed in Germany recently produced the following result: one in two expects AI to noticeably change society and 90 percent demand safe AI applications, but only 45 percent want bans (Bitkom, 2020). Close to the border between personal and media communication are actors who enjoy special relevance due to their status and thus communicate publicly. One example: Kai-Fu Lee, AI luminary and investor from China, says that the race for AI supremacy is the central race for the global market and thus for power. Europe, according to his assessment, is only fighting for third place behind China and the USA, if at all (SPIEGEL 6/2019). Lee thus takes up content from corporate communications (see above), communicates as an individual on the topic of AI and the future (Process-based Innovation Communication), and in turn provides new impetus for further lines of communication at

- *Innovation Communication as the subject of media coverage:* Innovation Communication as corporate or interpersonal communication is carried into society via media coverage and positioned there for follow-up discussions. This is exactly what can be observed with the topic of AI. The excerpts from the data material cited so far show that journalism has illuminated the topic of AI much more intensively in recent years. This level of innovation communication thus also makes a central contribution to the circular model. AI has become a central aspect of the debate about how we will work and live in the future. Corporate, interpersonal and media communications have all been equally involved.

5   Conclusion

The automated content analysis has provided broad access to the question of how german media coverage can be described in the context of innovation. The period of 20 years and the focus on

five leading newspapers and magazines enabled a total sample of 127,182 articles to be analyzed automatically using *RStudio*. Four central findings emerge from this, based on the aforementioned research questions:

1) *Innovation is not a trend, but an ongoing issue.*

There are fluctuations throughout the entire period under review. The clear peak in the volume of reporting on innovation can be dated to the years 2004/2005 (about 8,000 articles). Subsequently, the number decreased significantly and fell to about 5,000 articles (annually and summed up on the basis of the five leading media) by 2010. Since then, the curve has been rising slowly but steadily, exceeding the 6,000 article mark in 2019. These developments show: Innovation is not an acute (but an ongoing) trend word that has been a permanent topic of media coverage for more than 20 years. Innovation as a topic of media coverage is manifold, but often only a minor aspect/reference and therefore part of the population via the search function. Nevertheless, it may be stated: Innovation is a central topic of media discourse and is taken up equally across all leading media.

2) *Innovation is the central currency of the economy (perspectives)*

A closer look at the thematic location of the articles shows the clear correlation: Innovation is primarily to be located within the economy. Companies and their perspectives are often co-determined by the potential for innovation and are therefore the central determinant for evaluation (e.g. on the stock market). Business and its players use the attention that the term innovation alone generates in editorial departments and among the public to place their own messages and position the company as frequently as possible in the context of innovation. This is also shown by a look at the companies that appear particularly frequently in the context of innovation: Apple, Google, BMW, Volkswagen, Microsoft, and Siemens are linked to innovation with above-average frequency in purely quantitative terms, while small and medium-sized enterprises or smaller companies appear only to some extent at most.

3) *Innovation is an evaluation criterion for political actors*

The actors most frequently associated with innovation are almost exclusively to be found in politics. Angela Merkel is named by a wide margin, followed by Gerhard Schröder, Donald Trump and Peter Altmaier, among others. The list shows: Innovation can be seen as an assessment criterion for top politicians. The media and the population expect innovation, and innovation has an enormous (symbolic-political) impact. The interconnection between innovation, business (especially the automotive industry) and decision-makers is also clear from the positions of the players: Only heads of government, heads of companies or ministers from the departments of business, finance and research are on the list of the most frequent players in the context of innovation.

4) *Innovation is connected in many ways*

Detailed contextual analysis reveals further details surrounding innovation. Across all articles, innovation is often discussed in the context of novelty, enterprise, business and start-ups. Also common is the geopolitical reference to the world powers of the U.S. and China, and their globally dominant digital corporations (Facebook, Google, Apple, Alibaba). In the word network, innovation is the centerpiece along the dimensions future (time dimension) - market environment (action dimension) - key figures (evaluation dimension). In this spectrum, innovation is multi-layeredly connected and linked, dominant as a central theme that should permanently influence the future of mankind (for the better).

From this inventory of the term innovation in German media, three short recommendations for editors are derived in the following:

- **More distance from the term:** Precisely because the definitional precision is not present in everyday life and the media, but the term is used sweepingly, a critical and more distanced attitude is recommended in journalism. This means that the use of the term should be questioned critically in each individual case: If it is only an idea (invention), an advertising message that cannot be concretized, or a long-established innovation, the correspondingly correct terminology is preferable.

- **More precision with the term:** The historical and theoretical groundwork has created a variety of ways in which the term can be meaningfully differentiated. This refers to the dimension (most innovations are incremental), but also the innovation object (product, process) and subject (innovation for a country, an industry or globally). With these additions, the term gains in sharpness and meaningfulness.

- **More discourse around the term:** The present survey shows that the term is used in almost all cases detached from dimensions and characteristics (see above). Therefore, for the sake of comprehensibility, it would be desirable that the discussion of the term not only takes place within the production of texts (by editors), but is also to be found in the corresponding text itself. This creates sensitivity for the problem beyond the journalistic activity and contributes to a broad discussion - and ultimately to the gain of knowledge for all.

In summary, innovation in media coverage is a buzzword (strongly prevalent in the entire study period and especially around the years 2004-2006), a foreign word (media coverage almost universally refrains from more precise definitions or systematizations of the term) and a keyword, which on the one hand is interpreted as an approach to the topic of business and management, and at the same time as a central evaluation criterion for success and perspective. This result is at the same time an argument for dealing with the term in a more critical, distanced and reflective way. This is a responsibility that editorial teams and all those involved in innovation must face up to. In addition, these findings lend themselves to follow-up analyses, for example, also on the basis of qualitative case studies, in order to supplement the findings of the longitudinal study with details and typicalities.

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