

MULTIPLE PERSPECTIVES ON INNOVATION:
INSIGHTS FROM CORPORATE COMMUNICATIONS,
INNOVATION POLICY AND THE DISCLOSURE OF
R&D.

Inaugural – Dissertation

zur

Erlangung der wirtschaftswissenschaftlichen

Doktorwürde

des Fachbereichs Wirtschaftswissenschaften

der Philipps-Universität Marburg

vorgelegt von

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Diplom-Kaufmann aus Düsseldorf

Marburg

September 2013

Für meine Eltern

Vorwort und Zusammenfassung der Dissertation

Innovationen sind in aller Munde, denn Sie gelten als Triebfedern für den ökonomischen Fortschritt und sozialen Wandel. Obwohl kaum ein Objekt in den Wirtschaftswissenschaften so intensiv behandelt worden ist wie die Innovation, machen die Dynamik sowie die Vielzahl an Perspektiven weitere Forschungsarbeit notwendig und äußert spannend.

Die vorliegende Dissertation beschäftigt sich mit Innovationen im engeren sowie im weiteren Sinne. Es wurden bewusst zum Teil stark kontrastierende Themenstellungen behandelt – mit dem Ziel, einen Forschungsbeitrag für unterschiedliche Gebiete zu leisten. Naturgemäß ist folglich kein einheitliches Forschungsfeld in dieser Dissertation zugegen; Innovationen bilden für alle Essays jedoch den rahmengebenden Spannungsbogen. Diese Dissertation besteht aus acht Essays (Essay I-VIII).

Essays I-IV können dem Bereich Corporate Communications zugerechnet werden. Essays I und II sind in Zusammenarbeit mit dem Lehrstuhl für Allgemeine Betriebswirtschaftslehre und Logistik von Prof. Dr. Ingrid Göpfert entstanden. Essay I betrachtet die Zusammensetzung von Unternehmensvorständen hinsichtlich Logistik-Kompetenzen und zeigt auf, dass sich deren Vorhandensein finanziell positiv auswirkt. Essay II untersucht die Kommunikation von Logistik und Supply Chain Management anhand von Geschäftsberichten und veranschaulicht die gestiegene Relevanz der Logistik und des Supply Chain Managements. Essay III untersucht inwiefern Buzzwords in der Unternehmenskommunikation verwendet werden und macht Unterschiede auf industrieller und geographischer Ebene deutlich. Es kann festgestellt werden, dass Unternehmen die finanziell schlechter operieren, entschieden mehr Buzzwords in der Unternehmenskommunikation benutzen, um somit Informationen zu verschleiern bzw. um Ergebnisse schön zu reden. Essay IV betrachtet empirisch die lexikalische Entwicklung des Wortes Innovation im Zeitraum von 1980 bis 2010. Es wird dargelegt, dass das Wort Innovation um das Millennium herum am populärsten war.

Essays V und VI können dem Bereich Innovation Policy zugeordnet werden. Essay V behandelt aus der Perspektive des Merger Reviews die Bedeutung des Corporate Entrepreneurships. Es wird dargelegt, dass der Diversitätsgedanke in Forschungsprozessen von fusionierten Unternehmen aufrechterhalten werden sollte, da die Theorie und Empirie des Corporate Entrepreneurships an sich ausreichend intrinsische Argumente liefert. Essay VI untersucht anhand von Patentdaten die technologische Wissensbasis der deutschen Solarindustrie und zeigt auf, dass der Eintritt in die Solar-Schlüsseltechnologiefelder

bevorzugt durch die technologische Diversifikation von Unternehmen erfolgt. Darüber hinaus kann nachgewiesen werden, dass die Scheiterungswahrscheinlichkeit von Neugründungen in den frühen Phasen des Lebenszyklus aufgrund der intensiven öffentlichen Förderung tendenziell geringer ist.

Essays VII und VIII werden dem Bereich Disclosure of R&D zugerechnet. Essay VII analysiert empirisch die Glaubwürdigkeit der Innovationskommunikation von deutschen Unternehmen und identifiziert unterschiedliche Innovationskommunikationstypen, welche hinsichtlich ihrer Glaubwürdigkeit untersucht werden. Essay VIII baut auf dem vorangegangenen Essay auf, erweitert die Fragestellung auf ein internationales Sample und zeigt auf, dass Transparenzbemühungen hinsichtlich F&E und Innovation gegeben sind.

Die vorliegende Dissertationsschrift wurde gemäß § 8 der Promotionsordnung des Fachbereichs Wirtschaftswissenschaften der Philipps-Universität Marburg vom 8. Juni 2009 als kumulative Leistung erstellt.

Sieben der in dieser kumulativen Dissertationsschrift enthaltenen Essays sind entweder bereits publiziert oder für eine Publikation eingereicht. Ein weiteres Essay wurde bei einer Konferenz eingereicht, jedoch abgelehnt, infolgedessen überarbeitet und befindet sich im formalen Status eines Arbeitspapiers. Aus diesem Grund bestehen Unterschiede in der Formatierung. Das Format der enthaltenen Essays entspricht entweder dem der originalen Formatierung der Publikation oder dem geforderten Format zur Einreichung als Paper. Auf die nachträgliche Einfügung von durchgehenden Seitenzahlen wurde verzichtet, da dadurch die Beiträge verändert würden und somit nicht mehr dem Originalzustand der publizierten oder eingereichten Version entsprächen. Zur Orientierung soll die Inhaltsübersicht auf den Seiten 6 und 7 dienen.

Danksagung

Diese Dissertationsschrift ist in den drei Jahren während meiner Tätigkeit als wissenschaftlicher Mitarbeiter am Lehrstuhl für Technologie- und Innovationsmanagement des Fachbereichs Wirtschaftswissenschaften an der Philipps-Universität Marburg entstanden. Über die Jahre der Arbeit an dieser Dissertation bin ich von einer ganzen Reihe von Menschen begleitet und unterstützt worden, denen ich an dieser Stelle von Herzen danken möchte.

An erster Stelle gilt mein besonderer Dank meinem Doktorvater und akademischen Lehrer Prof. Dr. Michael Stephan, Inhaber des Lehrstuhls für Technologie- und Innovationsmanagement an der Philipps-Universität Marburg. Ihm danke ich für regen Austausch, konstruktive Kritik und viele Diskussionen, welche meine Arbeit maßgeblich geprägt haben. Danken möchte ich ihm auch für das in mich gesetzte Vertrauen und die großen Freiräume, welche er mir als Chef und Betreuer in meiner akademischen Arbeit in Forschung und Lehre gewährt hat. Darüber hinaus gilt meine Danksagung auch Herrn Prof. Dr. Torsten Wulf, Inhaber des Lehrstuhls für Strategisches und Internationales Management an der Philipps-Universität Marburg, für die Übernahme des Zweitgutachtens. Weiterhin möchte ich mich bei Prof. Dr. John Penrose (San Diego State University) und Prof. Dr. Rian-Beise Zee (Ritsumeikan Asia Pacific University) für die Ermöglichung von Forschungsaufenthalten bedanken.

Darüber hinaus gilt mein Dank all meinen Kolleginnen und Kollegen des TIM Lehrstuhls sowie angrenzender Lehrstühle, besonders Steffi, Pepe, Martin, Julia, Severin, Kai, Stefan und Michi. Besonderer Dank gilt natürlich auch Wanja und Benni für die fruchtbare akademische Zusammenarbeit. Natürlich danke ich auch unserer Sekretärin Christel Dehlinger, die bei vielen Problemen und Fragen immer eine große Hilfe war.

Ganz besonders dankbar bin auch meiner Freundin Marlies, die mich in vielen schwierigen Phasen immer wieder unterstützt und aufgebaut hat.

Bedanken möchte mich schlussendlich auch bei meinen Jungs von FUFL (Torsten „*The Story*“ Isecke, Patrick „*schwambo*“ Glasauer, Daniel „*Düse*“ Blum, Lukas „*Tribun*“ Pütz, Jan „*Pumpe*“ Israel, George „*der griechische Hammer*“, Dr. Ibo Gaden, Eu „*isst die Katze das noch?*“ Black, Nima „*frisches graues*“ Nader, Florian „*Floki*“ Panic, Freddy „*crispy disc*“ Arévalo, Andreas „*Rattenjunge*“ Dernbach, Christoph „*Kolle*“ Kloske, Dominik „*is he her*“ Duschek und Alexander „*Hetsch*“ Heczko) die für viel Abwechslung und Spaß während meines Studiums und meiner Promotion gesorgt haben.

Marburg, im September 2013

Malte Ackermann

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An Empirical Analysis of the Board Composition Concerning Logistics Competencies

Autoren: Ingrid Göpfert, Michael Stephan, Wanja Wellbrock, Malte Ackermann

World Academy of Science, Engineering and Technology (75) 2013, 197 - 203

ESSAY II

Communication of logistics within multinational corporations: an exploratory study

Autoren: Ingrid Göpfert, Michael Stephan, Malte Ackermann, Wanja Wellbrock

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ESSAY III

How cutting edge is your blue sky thinking? Empirical evidence on the use of buzzwords as strategic instruments in annual reports

Autoren: Malte Ackermann, Michael Stephan

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ESSAY IV

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Autor: Malte Ackermann

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Essay I:

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Status: *Veröffentlicht in: World Academy of Science, Engineering and Technology (75) 2013, 197-203.*

An Empirical Analysis of the Board Composition Concerning Logistics Competencies

Ingrid Göpfert, Michael Stephan, Wanja Wellbrock, and Malte Ackermann

Abstract—Empirical insights into the implementation of logistics competencies at the top management level are scarce. This paper addresses this issue with an explorative approach which is based on a dataset of 872 observations in the years 2000, 2004 and 2008 using quantitative content analysis from annual reports of the 500 publicly listed firms with the highest global research and development expenditures according to the British Department for Business Innovation and Skills. We find that logistics competencies are more pronounced in Asian companies than in their European or American counterparts. On an industrial level the results are quite mixed. Using partial point-biserial correlations we show that logistics competencies are positively related to financial performance.

Keywords—Logistics, supply chain management, content analysis, executive boards, multinational corporations.

I. INTRODUCTION

LOGISTICS and supply chain management have become increasingly important in recent years. The growing internationalization and globalization process has led to a further rise in relevance [1]-[4]. Especially the growing distances between the participating companies result in increasing problems in ensuring a most efficient and effective supply at each value-added step. The same applies for the information flow between the companies involved in an increasingly complex and global supply chain.

To ensure an efficient flow of goods and information the alignment of the management is becoming more flow-oriented [5],[6] and is not limited to the single company itself, but rather all strategic important suppliers as well as customers have to be integrated into the decision process [7],[8]. Following the concept of a flow-based process optimization, logistics as an instrument for ensuring an effective and efficient flow of objects is gaining further importance. Therefore logistics is no longer limited to the realization of operative transport, handling, and storage activities, but has emerged in terms of a flow-oriented leadership as a new

management paradigm [9],[10]. Supply chain management – as a new, modern level of logistics – with a clear company overarching orientation is subject to the same developments and is already playing an important role in corporate management. Supply chain management will become even more significant in the future [11],[12].

Multinational corporations are often characterized by very complex international linkages between independent companies. Therefore, the management of the various object and information flows is of particular relevance for these companies and the problems described are especially relevant in this area [13],[14].

The aim of the paper is to analyze how logistics, respectively supply chain management, is established at the top management level of multinational corporations. In this paper we define logistics competencies as the implementation of executive board members being assigned to logistics tasks, leading to the following research question:

RQ₁. To what extent are logistics competencies implemented in the executive boards of multinational corporations?

Furthermore we examined if the implementation of logistics competencies on the top management level is related to financial performance indicators:

RQ₂. Is the implementation of logistics competencies related to financial performance?

This paper is structured as follows. We are providing a literature review on the subjects of logistics and supply chain management as well as content analyses in this area. In the methodological part we describe the composition of our sample, and the content analysis as a research approach. This is followed by a presentation of the results and a conclusion, providing some academic and practical contributions.

II. LITERATURE REVIEW

A. Logistics and Supply Chain Management

The evolutionary process of logistics can be divided into three main stages [15]. The first stage describes logistics as a functional specialization on activities associated with the spatial and temporal transformation of goods. Logistics departments in companies are mostly aimed directly at operational, material flow-related activities and play only a minor role in the context of strategic planning [16]. The second stage extends logistics to an enterprise-divisional and

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cross-company coordination of all flows of materials, goods and information. In this function, logistics gains significantly strategic relevance [17],[18]. In the latest stage logistics is seen as a new leadership doctrine. Logistics is now interpreted as the management of flow systems. The entire company is designed flow-oriented and the corporate management is focused on logistics objectives [19],[20]. According to the third stage logistics can be described as a modern management concept for the development, design, management, and implementation of effective and efficient flows of objects (goods, information, money and financial flows) in enterprise-wide and cross-company value added systems [21].

Definitions of supply chain management can be divided into two alternative schools of thought. Authors of the first group define supply chain management as a special form of logistics or even as synonymous [22],[23]. The second group interprets supply chain management more broadly as a kind of general cooperation or relationship management. As representatives of the second group, Johnson/Wood/Wardlow/Murphy (1999) describe supply chain management as "... somewhat larger concept than logistics, because it deals with managing both the flow of materials and the relationships among channel intermediaries from the point of origin of raw materials through to the final consumer" [24].

In this paper we are following the definition of Simchi-Levi/Kaminsky/Simchi-Levi (2009), who emphasize that "... we will not distinguish between logistics and supply chain management ..." [25]. Considering both terms as synonymous, supply chain management can be defined as a modern concept for corporate networks to exploit cross-company success potentials by the development, design, management, and implementation of effective and efficient goods, information, money, and financial flows [26]. This definition shows the close relationship to logistics. For that reason we will only use the term logistics in the remainder of the article.

B. Content Analysis in Logistics

While content analysis has been well established in various areas of management and social sciences [27],[28]; in the field of logistics it is limited to only a few studies [29]. These papers are mainly focused on the determination of different research methodologies or approaches and the influence of other disciplines on logistics.

Spens/Kovács (2006) for instance observed three journals from 1998 to 2002 identifying different research approaches in logistics. The authors distinguished between deductive, inductive and abductive research processes [30]. Seuring and Gold (2012) instead analyzed different literature review papers and compared them in terms of primary research approaches [31]. Focused on the influence of other disciplines onto logistics – for example marketing, accounting, psychology or sociology – Stock (1997) analyzed four journals over a period of 16 years (1980 – 1996) [32]. Further examples of the use of content analysis in logistics are

Craighead/Hanna/Gibson/Meredith (2007) [33], Croom/Romano/Giannakis (2000) [34], Sachan/Data (2005) [35], Frankel/Naslund/Bolumole (2005) [36] and Anderson/Jolly/Fairhurst (2007) [37]. To date, we could not find any logistics study using content analysis in the area of board composition or annual reports in general. All existing studies only examined academic journals.

Corporate reporting plays a significant role within content analysis in the area of business communication research [38], [39]. These papers cover for instance the examination of the readability of annual reports [40], the use of negative or positive expressions [41] and special linguistic structures as well as rhetorical elements [42]. Other studies examine social responsibility efforts [43],[44], environmental aspects [45],[46] or risk reporting [47],[48].

Papers concerning the composition of the companies' boards are mostly focused on cultural characteristics [49],[50] or the gender composition of the boards and its influence on corporate effectiveness, social responsibility and firm reputation [51]-[53]. Most studies in this area are related to the board of directors and only a few articles examine the composition of executive boards [54]-[56]. So far, the analysis of the impact of logistics on the companies' board composition still represents an unexplored field of research.

III. METHODOLOGY

A. Data Collection

Choosing a sample that will suit our research purpose we were looking at companies with high expenditures on research & development. Since logistics is a highly dynamic process [57], firms with high expenditures on research & development tend to be more adaptive to an ever-changing business environment [58]. We chose the 500 publicly listed firms with the highest expenditures on research & development worldwide, according to the British Department for Business Innovation & Skills. Financial data was taken from the Bureau van Dijk and their Osiris database. Thereby we had 360 companies in the final sample. To examine, if logistics competencies vary across industries, we grouped the firms according to the Global Industry Classification Standard (GICS). To derive a comparable international overview, we were only examining annual reports, no form 10-K or 20-F was included. Due to data availability we were focusing on three specific years: 2000, 2004 and 2008. Since not all annual reports from the companies were accessible within the sample period, 872 annual reports were in the final sample. The annual reports were analyzed regarding the existence of an executive board member responsible for logistics tasks. Therefore, we only examined the parts of the annual reports which contain information about the executive boards. The titles or descriptions of the board vary heavily; they range from board of management [59] to executive committee [60] or just the term officers [61]. Despite the variety of names their functions are largely identical [62].

B. Measurement

To examine, if logistics competencies are implemented at the top management level, we used content analysis with the software MAXQDA. Content analysis as a research method is a systematic and objective technique to describe and quantify phenomena [63]-[65]. The quantitative part focuses on fixed selected characteristics, such as word frequencies, to ensure a high degree of reproducibility [66]. This method is based upon the thought that the occurrence of specific words and the encompassing structure are important indicators for the identification of hidden agendas and coherences [67]. Most findings suggest that the quantitative content analysis is a suitable instrument for analyzing strategic alignments of companies [68]-[70]. We were not solely searching for the terms “logistics” and “supply chain management”, but also include the terminologies “distribution”, “procurement”, “supply”, “supply chain”, and “transportation” [71]-[73] to cover a wide range of task descriptions.

IV. RESULTS

A. Summary Statistics

Table I provides a short overview of the relevant variables. Logistics competencies (Log. Comp.) is a dichotomous variable, where 1 indicates that logistics operations are implemented on the executive board, whereas 0 indicates the

TABLE I
SUMMARY STATISTICS

Variable	Mean	Std. Dev.
2000		
<i>Log. Comp.</i>	.278	.450
<i>Revenue</i>	17,570,226.22	27,381,141.40
<i>Employees</i>	52,849.40	74,372.76
2004		
<i>Log. Comp.</i>	.258	.438
<i>Revenue</i>	23,581,341.42	36,115,968.24
<i>Employees</i>	54,805.93	71,428.67
2008		
<i>Log. Comp.</i>	.277	.447
<i>Revenue</i>	33,439,220.40	5,449,6357.54
<i>Employees</i>	62,697.87	76,760.12

contradictory. The mean values for all years range from .278 in 2000 to .258 in 2004 and .277 in 2008. This indicates that slightly above 70% of the companies within the sample do not have a board member responsible for logistics competencies. Revenue and employees are metric variables; the mean values increased sharply within the sample period. Revenue rose from 17,570,226.22 (2000) over 23,581,341.42 (2004) to 33,439,220.40 (2008). The mean values for employees also received a strong increase, but the increase is staying well below the increase for revenues. Employees increased from 52,849.40 (2000) over 54,805.93 (2004) to 62,697.87 (2008).

B. Board Composition

Not all companies within the sample follow the same disclosure policy; therefore, we examined at first the differences among geographical regions and industries in terms of the functional description of the board responsibilities. Table II describes the percentage of companies which provide information about their functional board composition.

TABLE II
PERCENTAGE OF COMPANIES PROVIDING INFORMATION ON THE FUNCTIONAL COMPOSITION OF THE BOARDS

Year	2000 ^a (%)	(n)	2004 ^a (%)	(n)	2008 ^a (%)	(n)
Region						
<i>North America</i>	92.77	(83)	96.40	(111)	96.15	(104)
<i>Europe</i>	85.11	(94)	91.82	(110)	91.67	(120)
<i>Asia</i>	26.56	(64)	36.71	(79)	51.16	(86)
GICS						
<i>Cons. Dis.</i>	62.50	(32)	75.00	(48)	73.74	(49)
<i>Cons. Staples</i>	50.00	(4)	85.71	(7)	75.00	(8)
<i>Energy</i>	77.78	(9)	83.33	(12)	83.33	(12)
<i>Health Care</i>	82.35	(34)	86.36	(44)	88.00	(50)
<i>Industrials</i>	74.60	(63)	81.08	(74)	87.01	(77)
<i>Inform. Tech.</i>	70.00	(60)	73.55	(68)	72.73	(66)
<i>Materials</i>	68.00	(25)	78.79	(33)	84.38	(32)
<i>Telecom. Serv.</i>	81.82	(11)	81.82	(11)	91.67	(12)
<i>Utilities</i>	50.00	(4)	66.67	(6)	100	(6)
Total sample^b	71.72	(244)	78.96	(309)	81.82	(319)

^aNumbers of the functional composition of the boards are provided in percentage. Numbers in parentheses represent the total number of available annual reports for the respective unit.

^bDue to the fact that not all companies are directly assignable, the number of companies within the total sample differs from the accumulated total of all industries. The difference to the accumulated total of all geographical regions is attributed to the limitation of three main regions. Due to an insufficient representation, Africa, South America and Oceania are not included.

In the year 2000 71.72% of all companies published information about the functional composition of their executive boards. This number rose to 78.96% in 2004 and even to 81.82% in 2008. Therefore, a growing overall determination to disclose information can be recognized.

Among the geographical regions clear differences become apparent. More than 90% of the companies in North America depict information to their stakeholders. In Europe the numbers are slightly lower, but still range around 90%. For Asia the picture is quite different. In 2000 only 26.56% of the companies published functional information on the composition of their executive boards. The numbers are rising consistently throughout the sample period to 36.71% in 2004 and even 51.56% in 2008.

Between the industry sectors the differences are quite smaller. The majority of the numbers range from 100% in utilities (2008) to 62.50% in the consumer discretionary (cons. dis.) sector (2000). Values below 60% occur only twice, once in the consumer staples (cons. staples) sector and once in the utilities sector, each with 50% in the year 2000. The highest values could be identified within the sectors health care and telecommunication services (telecom. serv.) with more than 80%. Overall, across all sectors except for minor exceptions

within the sectors cons. dis., cons. staples and information technology (inform. tech.), a positive trend in the observed period is obvious.

Table III shows the distribution of the board members holding logistics competencies in the sample. Since data was not available for all years the figures below are pictured in percentage to allow a comparable overview. The percentages represent the relative frequency of the board members assigned to logistics tasks divided by the number of companies providing information on the composition of the board.

Year	2000 ^a (%)	(n)	2004 ^a (%)	(n)	2008 ^a (%)	(n)
Region						
North America	23.88	(77)	25.23	(107)	24.00	(100)
Europe	31.25	(80)	24.75	(101)	28.18	(110)
Asia	35.29	(17)	37.93	(29)	38.64	(44)
GICS						
Cons. Dis.	40.00	(20)	41.67	(36)	41.67	(36)
Cons. Staples	100	(2)	66.67	(6)	50.00	(6)
Energy	14.29	(7)	20.00	(10)	20.00	(10)
Health Care	32.14	(28)	21.05	(38)	20.45	(44)
Industrials	23.40	(47)	31.67	(60)	35.82	(67)
Inform. Tech.	19.05	(42)	16.00	(50)	14.58	(48)
Materials	41.18	(17)	26.92	(26)	37.04	(27)
Telecom. Serv.	11.11	(9)	0.00	(9)	0.00	(11)
Utilities	100	(2)	25.00	(4)	33.33	(6)
Total sample^b	28.00	(175)	26.23	(244)	28.20	(261)

^aNumbers of the functional composition of the boards are provided in percentage. Numbers in parentheses represent the total number of available annual reports for the respective unit.

^bFor the explanation of the differences between the numbers of companies within the total sample and the accumulated total of all industries and geographical regions see table II.

Looking at the sample means for all years, it becomes evident that less than every third company employed someone responsible for logistics within their executive board. In 2000 28% of the companies providing functional information had logistics competencies implemented within their executive boards. This rate drops slightly to 26.23% in 2004 and rises again to 28.20% in 2008. Therefore, neither a positive nor a negative trend can be derived.

Even though North American and European companies are more open to depict information on their board composition, they are less likely to hold logistics competencies in their top management level than Asian companies. In Asia more than 35% of the board members are assigned to logistics within the entire sample period. This rate is considerably higher than in Europe and North America with values below 30% with the exception of 31.25% for Europe in the year 2000.

Regarding the different industries, there are also clear differences observable. For further analysis the sectors cons. staples, energy, telecom. serv. and utilities are not considered anymore due to insufficient representation.

The establishment of logistics competencies within the executive boards seems to be most important for the cons. dis. sector. During the entire sample period the numbers range

above 40%, with a maximum of 41.67% in 2004 and 2008. The lowest values occur within the inform tech sector with less than 20% in each observed year. The high percentage within the cons. dis. sector is attributable to the fact that this sector includes the automobiles and components subsector. The automotive industry is usually considered as the role model for logistics. Therefore it is no surprise that the

TABLE IV
RESULTS OF THE PARTIAL POINT-BISERIAL CORRELATIONS

Control Variable	BML	Revenue
2000	2000	2000
	BML	1
<i>Employees 2000</i>	Revenue	.117*
		1
2004	2004	2004
	BML	1
<i>Employees 2004</i>	Revenue	.106**
		1
2008	2008	2008
	BML	1
<i>Employees 2008</i>	Revenue	.104*
		1

*Correlation is significant at the .1 level (1-tailed);** Correlation is significant at the .05 level (1-tailed).

implementation of logistics is already very advanced in this sector.

The development in the sectors health care and industrials is contrary. In the sector health care a strong decrease of -37.77% is identified during the sample period. In the industrials sector instead a large increase of 53.08% is observable. For the sectors inform. tech. (-23.46%) and materials (-10.05%) declines are reported; however the materials sector recorded the highest value in 2000 (41.18%) and still the second highest value in 2008 (37.04%).

C. Logistics Competencies and Financial Performance

Table IV shows the results of the point-biserial correlation using SPSS v.21. We controlled for possible size effects by using partial correlations with the variable employees. Since we assume that revenue is positively correlated to logistics competencies, we used one-tailed tests [74].

Table IV shows that there is a significant relationship between revenue and the implementation of logistics competencies at the top management level. In 2000 logistics competencies was significantly correlated to revenue, $r = .117$ ($p < .1$). In 2004 and 2008 revenue was again significantly correlated with logistics competencies, 2004: $r = .106$ ($p < .05$), 2008: $r = .104$ ($p < .1$). All correlation coefficients contain positive signs; still the strength of the relationship is weak. The results indicate that companies that have logistics competencies implemented in the executive boards are associated with higher revenues.

D. Contributions and Limitations

To our knowledge, this is the first study that quantifies and specifically concentrates on the board composition concerning logistics assignments. This could provide a framework for

further research in this area. From a business perspective, our research might be used as an overview or even benchmark for the relevance of logistics within multinational corporations.

Due to data and resource availability we examined only the years 2000, 2004 and 2008, while further research might include a larger period. In addition, the concentration on multinational corporations could also be a shortcoming of this study; the results might be different for small and medium size enterprises. Since we conducted a highly explanatory study across various industries and geographical regions, a specified research focus, for instance on single countries or single industries might lead to different results.

V. CONCLUSION AND FUTURE RESEARCH

The role of logistics within multinational corporations has rapidly evolved over the past couple of decades. Coming from a limited functional specialization, it has developed into a modern flow-oriented management philosophy. Logistics is today regarded as the management of flow systems. The entire company and especially the corporate management is flow-oriented. For that reason, we analyzed in our study how logistics is implemented within the executive boards as a proxy for organizational structure.

The results can be summarized within the following points:

- The observed companies are becoming more transparent concerning the functional composition of their executive boards. The percentage of companies that provide information rose from 71.72% (2000) to 78.96% (2004) and 81.82% (2008). This might be due to the increased relevance of corporate governance and transparency efforts made by multinational corporations.
- Based on the geographical differentiation Asian companies are more likely to establish logistics competencies at the executive level. The values for Asian companies increased from 35.29% (2000) to 37.93% (2004) and 38.64% (2008). For European and American companies the values are profoundly lower with all values staying below 30%, except the year 2000 with 31.25% for Europe. These results indicate that in Asian companies logistics is more valued at the executive level.
- On the industrial differentiation the picture is quite mixed. The sectors cons. dis. and materials stand out being well above the others. Cons. dis ranges from 40% (2000) to 41.67% in 2004 and 2008, whereas the materials sector ranges from 41.18% (2000) to 26.92% (2004) and 37.04% (2008). The lowest values could be identified within the inform. tech. sector with 19.05% (2000), 16.00% (2004) and 14.58% (2008).
- Overall, the implementation rate of logistics competencies is ranging around 28%. In 2000 the value was 28%; in 2004 it slightly declined to 26.23% and rose again to 28.20% (2008).
- The partial point-biserial correlations show that a significant positive relationship between logistics competencies and revenue exists. This means that

multinational corporations with someone assigned to logistics tasks perform financially better; showing the utmost importance of logistics for multinational corporations today.

This study provides evidence that logistics is already widely established within the executive boards of the observed companies. Due to the increasing complexity of the companies' environments and the observed relationship between logistics competencies and revenue, it might be assumed that in the near future logistics will receive more relevance on an executive level.

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Essay II:

Communication of logistics within multinational corporations: an exploratory study

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Status: *Veröffentlicht in: The Nordic Logistics Research Network (Hrsg.): Proceedings NOFOMA 2013, Göteborg 2013, S. 1-15.*

Communication of logistics within multinational corporations: an exploratory study

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ABSTRACT

Purpose - This paper examines how multinational corporations communicate their logistics or supply chain manufacturing efforts towards external stakeholders. It specifically addresses the differences on an industrial and geographical level.

Design/methodology/approach - Annual reports from 360 multinational corporations over a period from 1998 to 2008 are studied, resulting in 3,051 observations. The annual reports of the firms are analyzed regarding the occurrence of logistics and supply chain management terminologies, applying quantitative content analysis as a research method.

Findings - From 1998 to 2002 multinational corporations in Europe made a considerably higher effort in communicating their logistics and supply chain management endeavors than their North-American or Asian counterparts. From 2003 to 2008 the communication of logistics and supply chain management is more pronounced in Asian companies. Using the GICS industry classification scheme, we show that the sectors industrials, information technology, consumer discretionary and consumer staples do emphasize their logistics and supply chain management communication compared to the sectors energy, telecommunication services and utilities.

Research limitations/implications - The limitations on only one communication channel, the annual reports of the corporations, can be seen as one research limitation. Furthermore, the observed multinational corporations are mainly coming from research-intensive industries, which might bias our findings.

Practical implications/social implications - The analysis of logistics and supply chain management communication efforts within multinational corporations provides information about the importance of these areas on the top management level. Moreover, the results might serve as a key figure for researchers and practitioners to assess the strategic relevance of logistics.

Originality/value - This is the first paper that investigates the communication efforts of multinational corporations concerning logistics or supply chain management matters via annual reports, providing explanatory findings and a framework for further research.

Keywords: Logistics, supply chain management, multinational corporations, communication, content analysis.

1. INTRODUCTION

Logistics and supply chain management have become increasingly important in recent years. The growing internationalization and globalization process has led to a further rise in relevance (Kotzab *et al.*, 2009; Pope, 2011; Prasad and Sounderpandian, 2003; Tongzong, 2012). Especially the growing distances between the participating companies result in increasing problems in ensuring a most efficient and effective supply at each value-added step. The same applies for the information flow between the companies involved in an increasingly complex and global supply chain.

To ensure an efficient flow of goods and information the alignment of the management is becoming more flow-oriented (Sevcik, 2003; Wagner and Enzler, 2006) and is not limited to the single company itself, but rather all strategic important suppliers as well as customers have to be integrated into the decision process (Crandall *et al.*, 2010; Waters, 2002). Following the concept of a flow-based process optimization, logistics as an instrument for ensuring an effective and efficient flow of objects is gaining further importance. Therefore logistics is no longer limited to the realization of operative transport, handling, and storage activities, but has emerged in terms of a flow-oriented leadership as a new management paradigm (Bretzke, 2009; Klaus, 2010). Supply chain management – as a new, modern level of logistics – with a clear company overarching orientation is subject to the same developments and is already playing an important role in corporate management. Supply chain management will become even more significant in the future (Göpfert and Wellbrock, 2013; Gripsrud *et al.*, 2006; Handfield *et al.*, 2011; Winkler, 2009).

Multinational corporations are often characterized by complex international linkages between independent companies. Therefore, the management of the various object and information flows is of particular relevance for these companies and the problems described are especially relevant in this area (Javalgi and Reisenwitz, 2001; Rimmer and Krome-Hamilton, 2008).

The aim of the paper is to examine to what extent logistics as a new flow-oriented management paradigm is implemented within multinational corporations. Since empirical evidence regarding the implementation of a flow-oriented management paradigm is scarce (Delfman *et al.*, 2010; Klaus 2010) and logistics ratios are not widely available (Bretzke, 2009; Göpfert, 2013), we try to measure this aspect using communication efforts concerning logistics as a useful proxy. Communication efforts mirror the management objectives and can be used as a sign for the strategic relevance (Frazier *et al.*, 1984; Landrum, 2008; Rutherford, 2005). We decided to use annual reports to gain comprehensive and comparable data from the top management level, leading to the following research question:

RQ₁. *To what extent is logistics communicated within the annual reports of multinational corporations in the period from 1998 to 2008?*

Furthermore we grouped the companies into different world regions (Kirkman *et al.*, 2002), looking for possible differences in the communication efforts, leading to research question two:

RQ₂. *Does the geographical heritage have an effect on the communication efforts of multinational corporations?*

Most empirical studies that examine communication efforts, find differences on an industrial level (for instance Hartman *et al.*, 2007), leading to research question three:

RQ₃. *Does the associated industry have an effect on the communication efforts of multinational corporations?*

Due to the fact that no prior research exists to build on, this study is highly explanatory, serving as a first step to empirically validate a model to estimate the strategic relevance of logistics. Moreover, the results might serve as a key figure for researchers and practitioners to assess the strategic relevance of logistics, since these figures are not widely available.

The paper is structured as follows. We are providing a literature review on the subjects of logistics and supply chain management as well as content analyses in these academic disciplines. In the methodological part we describe the composition of our sample, and the content analysis as a research approach. This is followed by a presentation and discussion of the results, providing academic and practical contributions.

2. LITERATURE REVIEW

2.1. Logistics and supply chain management

The evolutionary process of logistics can be divided into three main stages (Göpfert, 2013). The first stage describes logistics as a functional specialization on activities associated with the spatial and temporal transformation of goods. Logistics departments in companies are mostly aimed directly at operational, material flow-related activities and play only a minor role in the context of strategic planning (Klaus, 2009). The second stage extends logistics to an enterprise-divisional and cross-company coordination of all flows of materials, goods and information. In this function, logistics gains significantly strategic relevance (Sandelands, 1997; Wanke and Zinn, 2004). In the latest stage logistics is seen as a new leadership doctrine. Logistics is now interpreted as the management of flow systems. The entire company is designed flow-oriented and the corporate management is focused on logistics objectives (Delfmann *et al.*, 2010; Klaus, 2010; Sevcik, 2003). According to the third stage logistics can be described as a modern management concept for the development, design, management, and implementation of effective and efficient flows of objects (goods, information, money and financial flows) in enterprise-wide and cross-company value added systems (Göpfert, 2013).

Definitions of supply chain management can be divided into two alternative schools of thought. Authors of the first group define supply chain management as a special form of logistics or even as synonymous (Bowersox and Closs, 1996; Govil and Proth, 2002). The second group interprets supply chain management more broadly as a kind of general cooperation or relationship management (Christopher, 2011; Cooper *et al.*, 1997). As representatives of the second group, Johnson *et al.*, 1999 describe supply chain management as a "... somewhat larger concept than logistics, because it deals with managing both the flow of materials and the relationships among channel intermediaries from the point of origin of raw materials through to the final consumer".

In this paper we are following the definition of Simchi-Levi *et al.*, 2009, who emphasize that "... we will not distinguish between logistics and supply chain management ...". Considering both terms as synonymous, supply chain management can be defined as a modern concept for corporate networks to exploit cross-company success potentials by the development, design, management, and implementation of effective and efficient goods, information, money, and financial flows (Göpfert, 2013). This definition shows the close relationship to logistics. For that reason we will only use the term logistics in the remainder of the article.

2.2. Content analyses in logistics

While content analysis has been well established in various areas of management and social sciences (Duriiau *et al.*, 2007; Harwood and Garry, 2003); in the field of logistics it is limited to only a few studies (Montabon *et al.*, 2007). These papers are mainly focused on the determination of different research methodologies or approaches and the influence of other disciplines on logistics.

Spens and Kovács, 2006, for instance, observed three journals from 1998 to 2002 identifying different research approaches in logistics. The authors distinguished between deductive, inductive and abductive research processes. Seuring and Gold, 2012 instead analysed different literature review papers and compared them in terms of primary research approaches. Focused on the influence of other disciplines onto logistics – for example marketing, accounting, psychology or sociology – Stock, 1997 analysed four journals over a period of 16 years (1980 – 1996). Further examples of the use of content analysis in logistics are Craighead *et al.*, 2007; Croom *et al.*, 2000; Sachan and Datta, 2005; Frankel *et al.*, 2005; Anderson *et al.*, 2007 and Hazen *et al.*, 2012. To date, we could not find any logistics study using content analysis in the area of annual reports. All existing studies only examined academic journals.

Corporate reporting plays a significant role within content analysis in the area of business communication research (Deumes, 2008; Harwood and Garry, 2003). They cover for instance the examination of the readability of annual reports (Courties and Hassan, 2002), the use of negative or positive expressions (Crombie and Samujh, 1999) and special linguistic structures as well as rhetorical elements (Prasad and Mir, 2002). Other studies examine social responsibility efforts (Bouten *et al.*, 2011; Unerman, 2000), environmental aspects (Clarkson *et al.*, 2011; Guthrie and Abeysekera, 2006) or risk reporting (Deumes, 2008; Li, 2006). So far, the analysis of the communication of logistics efforts within annual reports still represents an unexplored field of research.

3. METHODOLOGY

3.1. Data collection

Choosing a sample that would suit our research purpose we were looking at companies with high expenditures on research & development. Since logistics is highly dynamic (Selviaridis and Spring, 2010), firms with high expenditures on research & development tend to have more adaptive capabilities suitable for fast changing business environments (Tassej, 2007). We chose the 500 publicly listed firms with the highest expenditures on research & development worldwide, according to the British Department for Business Innovation & Skills. Financial data was taken from the Bureau van Dijk and their Osiris database. Due to data availability, we had 360 companies in the final sample.

Concerning the geographical differences, we grouped the companies into three different world regions: North-America, Europe and Asia. Only 11 out of 360 companies cannot be assigned to this geographical classification. Two companies' headquarters are located in Australia, one in the Netherlands Antilles, one in Brazil and seven values are missing. To examine if the communication of logistics varies across industries, we grouped the firms according to the Global Industry Classification Standard (GICS). Using the GICS-classification on a two-digit sector level, 54 companies can be grouped into the consumer discretionary, 12 into the energy, 55 into the health care, 80 into the industrials, 87 into the information technology, 36 into the materials and 14 into the telecommunication services sector. Nine companies can be grouped into the consumer staples and six companies into the utilities sector, but are not

regarded further due to insufficient representation. No company within the sample belongs to the financials sector and seven values are missing. To derive a comparable international overview, we examined only annual reports, no form 10-K or 20-F was included. Our sample period ranges from 1998 to 2008, since before 1998 annual reports were not widely available in a digital format and ruled out the years after 2008 because of possible side effects of the financial crisis. Since not all annual reports from the companies were accessible within the sample period, 3051 annual reports were examined in this study.

3.2. Measurement

To examine the communication efforts regarding logistics we used quantitative content analysis with the software MAXQDA, which is a German-based software program designed for qualitative and quantitative data, text and multimedia analysis (VERBI Software Consult Sozialforschung GmbH, 2011).

Content analysis as a research method is a systematic and objective technique to describe and quantify phenomena in the social sciences (Downe-Wamboldt, 1992; Krippendorff, 1980; Sandelowski, 1995). The quantitative part focuses on fixed selected characteristics, such as word frequencies, to ensure a high degree of reproducibility (Elo and Kyngäs, 2008). This is based upon the thought that the occurrence of certain words can be important indicators for the identification of hidden agendas and motives (Breton, 2009). Empirical studies conducting quantitative analysis suggest that it is a suitable instrument for analysing strategic orientation of companies (Frazier *et al.*, 1984; Landrum, 2008; Rutherford, 2005). To capture the logistics communication efforts we were searching for the terms ‘logistics’ and ‘supply chain’, in every possible abbreviation. The number of logistics and supply chain terminologies is then divided by the length of the respective annual report. For instance Boeing used in its 2007 annual report 20 times logistics and supply chain terminologies with a annual report consisting of 60,661 words ($20/60,661 = 0,0003296$). This calculation is done for all years and all annual reports. Afterwards we derive mean values on a geographical and industrial level.

4. RESULTS

4.1. Communication of logistics efforts

Figure 1 represents the results of the quantitative content analysis showing the mean of the entire sample, and the mean after grouping the companies into three major geographical regions (North America, Europe and Asia). The numbers below the charts show the mean values for the occurrences of the terms ‘logistics’ and ‘supply chain’ divided by the number of words of the respective annual report. Looking at the entire sample, there is a positive trend observable in the communication efforts of multinational corporations (see the dashed line in figure 1). Over the entire period from 1998 to 2008 an increase of 10.68% is recorded. The values for the single years are subject to fluctuations, with high values in 2005 and 2007 and low values in 1999 and 2002. Hence for RQ₁ we propose that:

P₁. *The relevance of logistics within the corporate communication of multinational corporations increased by 10.68% during the period 1998 to 2008.*

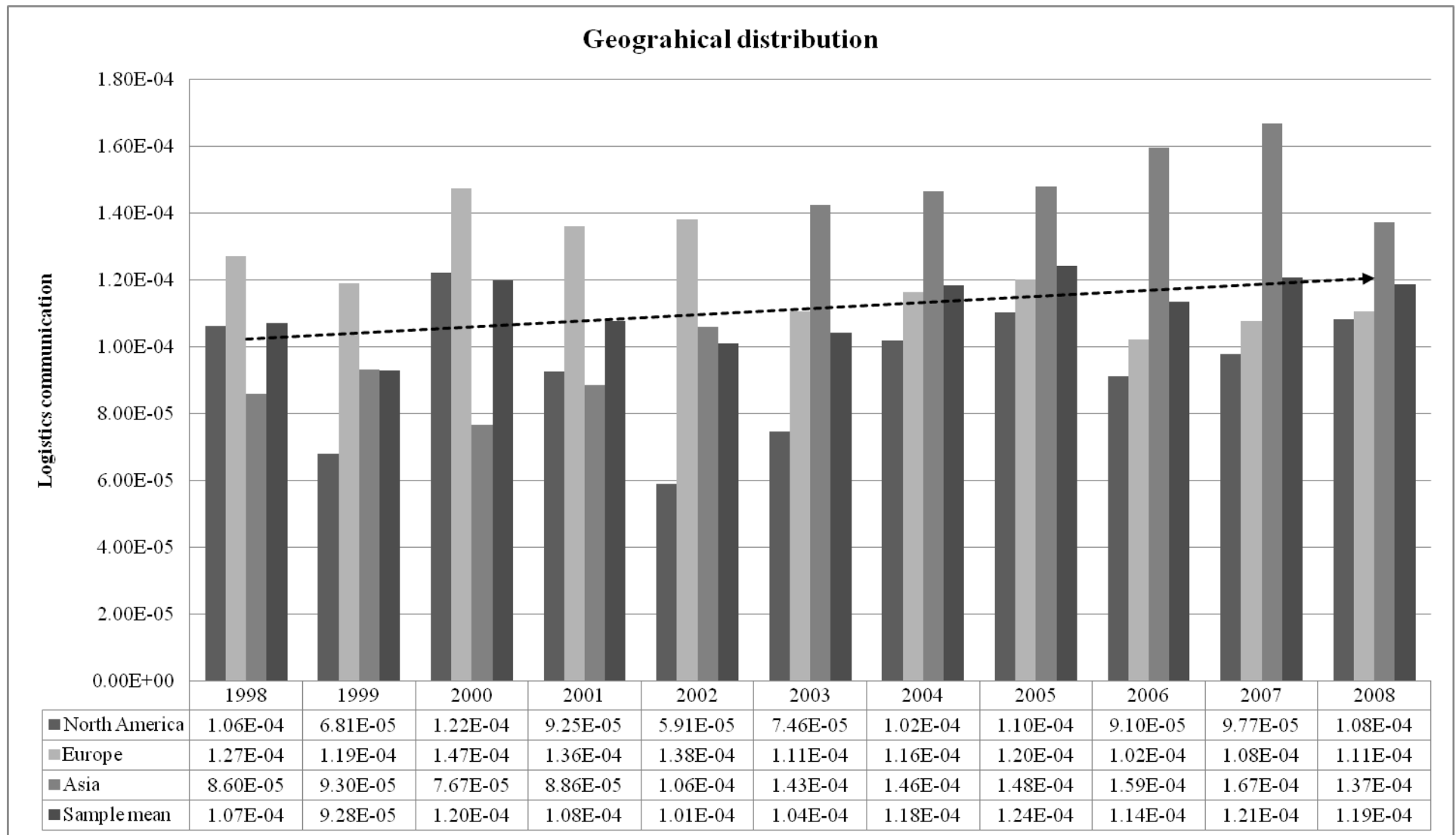


Figure 1. Communication of logistics on a geographical level

Looking at the geographical regions, differences become easily apparent. From 1998 to 2002 the communication of logistics was highlighted the most in Europe followed by North America and Asia. In the further course, communication efforts in Europe declined and at the same time increased in Asia. Therefore, from 2002 to 2008 logistics communication was most pronounced in Asia, followed by Europe and North America. Over the entire period opposite trend curves for the geographical regions appear. In Europe there was a strong increase of 16.14% from 1998 to 2000, followed by a steady decrease of 24.93%. In North America a clear trend is difficult to identify, however, over the entire period a low positive growth of 1.97 % can be seen. The development of communication in Asia is diametrically opposite. After the first three years from 2000 to 2007 a strong increase of 117.36% was recorded. Only in the last year, the value decreased again by 17.74%. The highest values for logistics communication efforts over the entire period and for all geographical regions occurred from 2005 to 2007 in Asia with increasing values; the lowest ones in North America in 2002 and 1999. In 2002, for instance, the logistics communication rate in Europe was 134% higher than in North America. Therefore we propose concerning RQ₂:

P₂. The geographical origin has an effect on the communication efforts, with considerably higher values for European and Asian companies.

Concerning the industrial distribution clear differences can also be seen (see figure 2). The differences between sectors are partially up to 97.7% (between industrials and telecommunication services in 1998). The communication of logistics efforts seems to be most pronounced in the industrials sector with the highest values for each year, except 2006 with the consumer discretionary sector on the first rank. Over the entire period from 1998 to 2008 an increase of 20.41% can be recorded. The highest values for the industrial sector and thus for the entire sample occur in the years 2008, 2007 and 2004.

The strongest increase is recorded within the consumer discretionary sector. After a relatively constant progression over the first five years, the communication rate rose from 2002 to 2007 by 75.41%, even if the value decreased again in the following year by 30.31%.

The information technologies sector has constant relatively high values as well, even if they are far below those of industries. From 1998 to 2002 information technologies reported the second highest values after the industrial sectors. Afterwards, however, it was overtaken by the consumer discretionary sector. Over the entire period the value for information technologies remains relatively constant with a peak in 2005 and losses in 2007 and 2002.

In relation to logistics communication efforts the materials sector follows in fourth rank with a large distance to the sectors telecommunication services and energy. Starting with a small increase of the communication rate (+14.71%) up to 2005, in the last three years a strong decrease of 39.67% occurred in the materials sector.

The communication rate of the health care sector experienced two strong declines and rises from 1998 to 2001, and then a steady increase started with a weak reduction in the last two years. Even if the health care sector outperformed the materials sector in the years 2000, 2006, 2007 and 2008, overall, the logistics communication is more pronounced in the later sector.

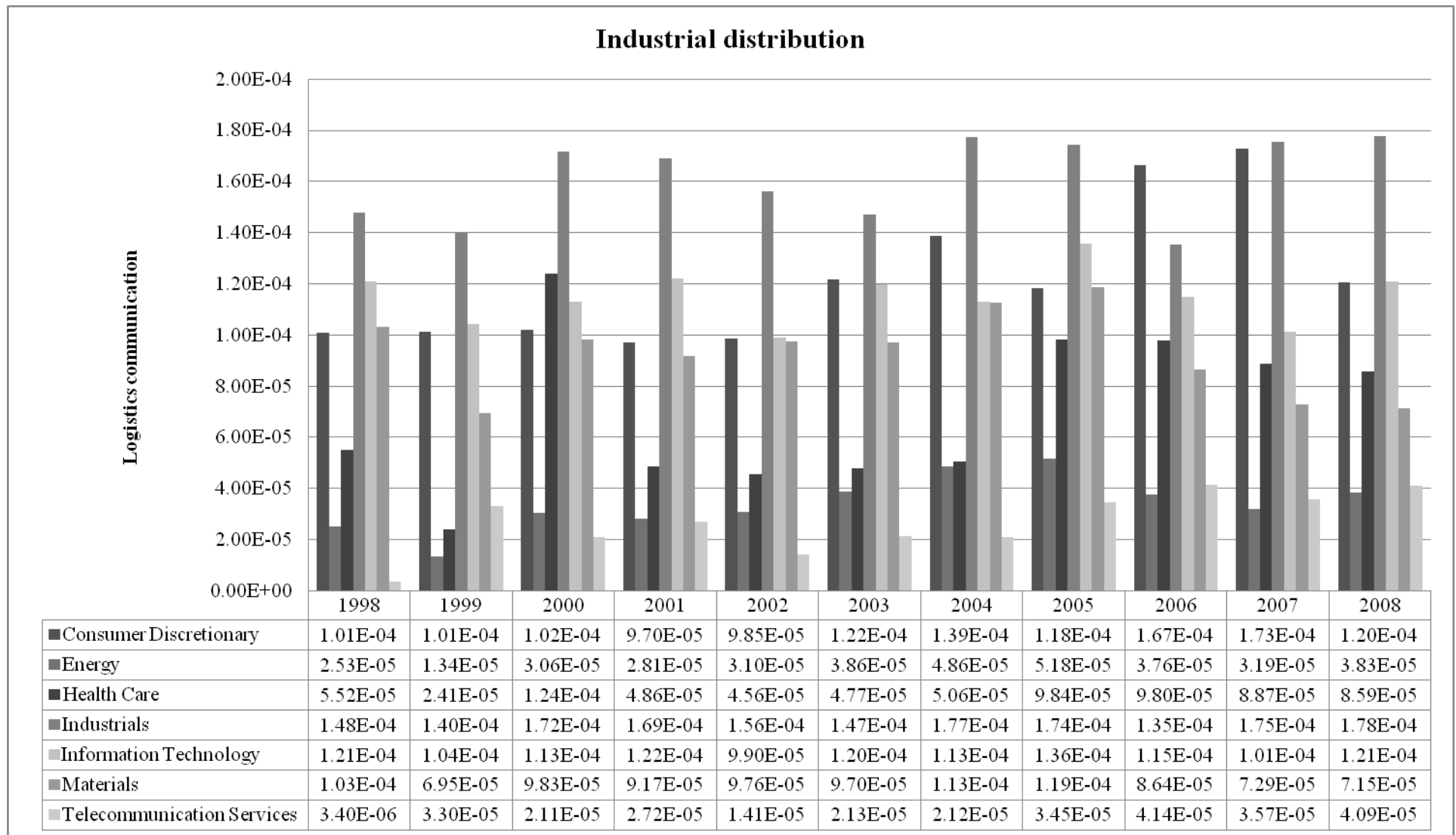


Figure 2. Communication of logistics on an industrial level

The last two sectors energy and telecommunication services follow at a clear distance. Both industries alternate repeatedly regarding the highest value. The lowest values for all sectors during the entire period occurred in 1998 for the telecommunication services sector and in 1999 for the energy sector. Overall, however, even for these two sectors an increase is reported. The energy sector rose from 1998 to 2008 by 51.63% and the telecommunication services sector due to the very low value in 1998 even by 1,103.11%. Compared to the year 1999 the increase was just 23.92%. Regarding RQ₃ we propose that:

P₃. *The industry has an effect on the communication behavior with a more pronounced logistics communication within the sectors industrials, consumer discretionary and information technology.*

5. DISCUSSION

This study investigates the communication of logistics in annual reports of multinational corporations. To our knowledge, this is the first study that quantifies and elaborates on the communication of logistics as such.

5.1. Summary of findings

We found that the relevance of logistics within the corporate communications in multinational corporations is increasing over the sample period. Between 1998 and 2008 the communication of logistics received a growth of 10.68%. This indicates an increasing strategic relevance of logistics, which can be interpreted as a higher awareness for logistics as a new flow-oriented management paradigm. The increased relevance of logistics can be attributed to the fact that supply chain management, as the highest level of logistics, became increasingly important in scientific literature around the turn of the millennium (Klaus, 2009). Due to the growing scientific debate a greater awareness among the companies could be achieved, which is reflected in a higher communication rate within the corporate reporting of multinational corporations. Another aspect might be the growing export orientation of multinational corporations and the global enlargement of the supply chains. This finding is in line with Pope, 2011; Prasad and Sounderpandian, 2003 and Tongzong, 2012, who have discovered as well that logistics is becoming increasingly important, especially due to growing globalization effects.

We also showed that the communication efforts concerning logistics vary across geographical regions. From 1998 to 2002 European corporations communicated logistics far more than their North American and especially Asian counterparts. Afterwards, from 2003 to 2008, Asian corporations led the ranking. This implies that European multinational corporations can be seen as pioneers in the external communication of logistics issues, while there was a slight delay for logistics communication within annual reports in Asia. It also implicates that the strategic relevance for logistics was from 1998 to 2002 more pronounced in European corporations, while from 2003 to 2008 the strategic relevance within Asian corporations was the highest. The subsequent rise of communication in Asia can be attributed to the increasing position of Asian multinational corporations in the world market.

Within the last years Asian corporations tend to be more export oriented than European or American corporations (Brunner and Cali, 2006); making logistics a core competency for Asian corporations which is mirrored by relatively high values in communicating logistics efforts.

Regarding the industrial differentiation, we showed that logistics communication is more pronounced within the sectors industrials, consumer discretionary and information technology. The industrials sector includes the areas engineering and building products, electrical equipment and industrial machinery. These areas are characterised by complex manufacturing processes and a high degree of cross-company division of labour; therefore, the relevance of logistics is quite high. The same applies to the consumer discretionary sector, which includes the automobiles and components subsector. The automotive industry is usually considered as the role model for logistics (Bennett and Klug, 2012; Pfohl and Gareis, 2005); therefore it is no surprise that the communication of logistics is already very advanced in this sector. The sectors with the lowest communication rate – energy and telecommunication services – are parts of the service sector. In these areas the procurement and distribution of goods as well as the logistics support of the production processes is traditionally very low; this is mirrored in a low communication rate.

5.2. Limitations, implications and further research

Due to data availability we examined only the years 1998 to 2008, while further research might include a larger period. Another constraint of this study can be the concentration on multinational corporations; the results can differ for small and medium size corporations. Since we conducted a highly explanatory study across various industries and geographical regions, a specified research focus, for instance, on single countries or single industries might lead to different results. Furthermore, we analysed only the occurrence of the terminologies “logistics” and “supply chain”; further expressions in the area of logistics such as procurement, distribution or transportation have not been checked due to multiple meanings.

Since this is the first study of its kind, the contributions are principally twofold. First, it is supposed to provide a starting point for further research. The study works as a first step to develop a model for estimating the strategic relevance of logistics and can serve as a key figure in the logistics context. This study is trying to lay ground for consecutive studies using more elaborate statistical procedures such as ANOVA regarding the geographical and industrial distribution of corporations. In our study we focused only on annual reports; another interesting point would be the analysis of different communication channels, for instance, corporate websites or printed media. Further research areas are the comparison of logistics communication with other communication areas such as marketing or finance and the detailed analysis of specific geographical regions or industries. Second, the results might serve as a key figure for researchers and practitioners to assess the strategic relevance of logistics in corporations.

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Essay III:

How cutting edge is your blue sky thinking? Empirical evidence on the use of buzzwords as strategic instruments in annual reports

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Status: *Eingereicht beim European Management Journal, 1-30.*

HOW CUTTING EDGE IS YOUR BLUE SKY THINKING?

EMPIRICAL EVIDENCE ON THE USE OF BUZZWORDS AS STRATEGIC INSTRUMENT IN ANNUAL REPORTS

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Keywords: Buzzwords, Content Analysis, Corporate Communications, Annual Report, Obfuscation hypothesis

JEL Classification: M00, M19, M30, M40

Abstract: In business and communications literature, it is usually stated that buzzwords are a negative outcome of corporate communications but empirical insights into the strategic utilization of buzzwords are scarce. Five research questions explore the existence, lifespan, industry, geography and performance effects of buzzwords. The explorative approach is based on a dataset of 3051 observations derived with quantitative content analysis from the annual reports of 360 multinational corporations in a sample period from 1998 to 2008. The results indicate that the usage of buzzwords in corporate communications is stable on firm level but varies across industries. Firms in North America use more buzzwords than their European or Asian counterparts. Using mixed-effects regression analysis we find that the utilization of buzzwords is negatively related to revenue, meaning that companies with low revenue deliberately tend to use buzzwords as strategic instruments to obfuscate their performance.

Introduction

Firms tend to describe their organizations, products, services, current or future status using phrases such as “leading-edge” (General Electric, annual report 2000, p. 15), “ground breaking” (Renault, annual report 2004, p. 4), “cutting edge” (Nikon, annual report 2006, p. 2) or “low-hanging fruit” (ABB, annual report 2008). Those phrases can generally be described in one term: buzzwords (Neuman, Nave & Dolev, 2010). According to the Merriam-Webster dictionary (2012) a buzzword is “*an important-sounding usually technical word or phrase often of little meaning used chiefly to impress laymen*”. Buzzwords in business or management are generally used to impress all sorts of stakeholders (Collins, 2000). They are a recurring component in corporate communications and their negative impression is generally depicted in several studies (Gregory & Watson, 2008; Ketelhöhn, 1998; Llewellyn & Harrison, 2006; Qian & Daniels, 2008). Still these studies only tab buzzwords as a negative outcome of corporate communications. To this date, there are no quantitative insights into the strategic usage of buzzwords in annual reports within the business and management literature.

To address this shortcoming, we study the phenomenon of buzzwords in corporate communications based on an exploratory research approach. First, we are interested in finding which buzzwords firms tend to use and how their relevance develops in corporate communication over time. Second, we are interested in the existence of possible patterns in the usage of buzzwords. Specifically, we analyze if the origin of firms, geographically or industry-wise, affect the usage of buzzwords. Third, is there a strategic motive for the utilization of buzzwords? Since a buzzword generally tends to be *important-sounding*, firms might use buzzwords to impress external stakeholders or to try to obfuscate information (Li, 2008).

The remainder is structured as follows. Section 2 provides a literature review concerning the specifics of buzzwords. This is supplemented by an overview of different compilations on

buzzwords from which we extract our set of buzzwords to develop our research questions. Section 3 contains the methodology. We describe the composition of our sample, the content analysis as a research instrument and different quality control measures. Section 4 states the results and the discussion. The paper concludes with limitations and contributions to management research and practice in section 5.

Literature Review

Existing research on corporate disclosure has focused predominantly on the information efforts and the amount of disclosure (Healy & Palepu, 2001). Research in corporate communications is focusing on the encompassing lexical properties (Courtis, 1995; Jones & Shoemaker, 1994; Li, 2008; Smith & Smith, 1971), the utilization of graphics (Frownfelter-Lohrke & Fulkerson, 2001; Moriarity, 1979; Penrose, 2008) or the differences between countries (Alford, Leftwich, & Zmijewski. 1993; Beattie & Jones, 2001; Vergauwen & Alem, 2005). To date, there is no qualitative or quantitative study that specifically concentrates on buzzwords in general within academic research. Literature review included the following databases: Business Source Premier, Google Scholar, Microsoft Academic, The International Bibliography of the Social Sciences, Emerald and JSTOR.

Some studies explore selected buzzwords. For instance, Cornwall/Brock (2005) examine the use “poverty reduction”, “participation” and “empowerment” in international development policy by exploring different configurations of word frames. They conclude that these words are overly used and have lost most of their original meaningfulness. Palmer, Cooper, & van der Vorst (1997) come to the same conclusion by examining the relevance of “sustainable development” and “sustainability” within development studies. Mirabela (2011) elaborates on the strategic use of language by specifically concentrating on the buzzwords “rightsizing”, “downsizing”, “re-engineering” and “de-layering” and their popularity among managers in Romania while dismissing employees. Within the literature on business and management research, a lot of studies include the term buzzword within their title (e.g.; Edwards, 2003;

Godin, 2006; Schultz, 2003; Sarginson, 2004), still no study focuses on buzzwords itself. We have identified a few studies on buzzwords in the field of linguistics or sociology, but these works can be only associated with minor contributions to our research focus, since they either focus on the linguistic intonation (Kissler, Herbert, Peyk, & Junghofer, 2007) or the buzzwords' effect on experimental learning (Hansen, 2009). In management literature, buzzwords are considered as a negative outcome of corporate communications (Gregory & Watson, 2008). Christensen, Cornelissen, & Morsing (2007) state that “[...] *corporate communications are glossy and superficial, shaped by fads and filled with buzzwords and fancy images (p.655)*”.

Annual reports as one of the main instruments of corporate communications provide comparable information regarding corporate activities and financial performance of different companies to fulfill the information needs of various stakeholders (Friedlob & Welton, 2001; Marion, 1998). Still they mix factual financial results with public relations information. Despite the existence of regulatory accounting standards such as US-GAAP or IRFS, there is still a lot of space for different depictions of information. Most firms employ independent external auditors to ensure the reports' conformity to the applied accounting standards. But that does not assure that the publications are the most accurate way of accessible information (Thomsett, 2007). Thus, annual reports leave room for some deliberately disposed information for public relations and impression management (Brennan, Guillamon-Saorin, & Pierce, 2009; Cho, Michelon, & Patten, 2012). Even though buzzwords have been mentioned within the context of corporate communications, there is no study that explores the quantitative perspective on buzzwords in corporate communications and their utilization, which leads us to our with our first research question:

RQ1. Which are the most-used buzzwords in corporate communications?

Buzzwords are associated with a certain lifespan, which implies that buzzwords might change over time (McNary, 2003). Davis (2012) even proposes that buzzwords can be ordered in analogy to the product lifecycle in a lifecycle of popularity. The product life cycle, which consists of the market introduction, the growth, the maturity and the saturation stage is transformed by Davis into the launch, the corporate acceptance and the end of life stage of buzzwords. Therefore, we consider the development of different buzzwords over our sample period, leading to research question 2:

RQ2. Do buzzwords have a specific lifespan?

To continue, since the origin of companies affects communication efforts (Hartman, Rubin & Dhanda, 2007; Rondinelli & Berry, 2000) we further analyze research question 3:

RQ3. Does the geographical origin affect the usage of buzzwords?

Most studies within the fields of corporate communications show that the associated industry affects the communications efforts (e.g. Andras & Srinivasan, 2003; Zinkhan & Cheng, 1992) leading to research question 4:

RQ4. Does the associated industry have an effect on the usage of buzzwords?

A popular hypothesis among corporate disclosure research is the “obfuscation hypothesis” which claims that poorly performing firms use textual complexity to obfuscate information within their corporate communications and to undermine reasonable corporate governance efforts (Bloomfield, 2002; Smith, Jamil, Johari, & Ahmad, 2006). So far, empirical results concerning the “obfuscation hypothesis” have come to contradictory results: Some studies found empirical support for this hypothesis (Baker & Kare 1992; Curtis, 1995; Li, 2008; Subramanian, Insley, & Blackwell, 1993). Other studies do not support a relationship between financial performance and textual complexity (Curtis, 1986; Linsley & Lawrence, 2007; Rutherford, 2003). In this line of research, we examine research question 5:

RQ5. Will firms deliberately use buzzwords to obfuscate information?

Research Methodology

To classify which buzzwords may be suitable for our research questions, we identify 66 compilations from five different categories that gathered buzzwords over various periods, ranging from 1990 to 2012. These compilations of buzzwords are obtained from different methodological backgrounds, see table 1:

Table 1. Compilations on buzzwords

Type of study	Number of studies
(1) Survey	15
(2) Quantitative content analysis	8
(3) Curriculum vitae	4
(4) Business-News	18
(5) Personal assessments by business professionals	21

The term survey includes inquiries on entrepreneurs, professionals in public relations or readers of business magazines. Compilations applying content analysis focus primarily on print or media releases. The next group consists of compilations on buzzwords that people should avoid in their curriculum vitae, conducted by business-coaching experts. Business news regarding buzzwords are studies by news magazines and newspapers. We only select magazines or papers that have a business or management affiliation such as Harvard Business Review. Compilations that are described above as personal assessments by business professionals are mostly judgments on buzzwords by public relations or marketing-experts. To obtain a codebook with buzzwords suitable for further analysis, we decide to use buzzwords only if they appear at least four times in all studies. This decision represents a compromise between the total number and the relevance of specific buzzwords. Consequently, we develop a codebook of 102 root words on buzzwords. For instance, “Game changer”, “Game Changers” and “game-changing” or “Innovative” and “Innovation” are considered in our codebook as one root-word. The complete codebook contains in total 224 buzzwords and is displayed in table 6 in the appendix.

We focus on companies with high expenditures on Research and Development (R&D). Since buzzwords are highly volatile (Collins, 2000) firms with high R&D expenditures tend to be more adaptive to an ever-changing business environment resulting in volatility in corporate communications (Tassey, 2007). We choose the 500 publicly listed firms with the highest global R&D expenditures worldwide according to the British Department for Business Innovation & Skills. Financial data is taken from Bureau van Dijk and their Osiris database. To get a comprehensive and comparable overview on the firm specific buzzwords, we concentrated on examining annual reports from 1998 to 2008. Due to data availability, we collected data about 360 companies in the final sample leading to 3051 observations in total.

Data analysis

Content analysis as a research method is a systematic and objective technique of describing and quantifying phenomena (Bartkus, Glassman & McAfee, 2004; Krippendorff, 1980; Indulska, Hovorka, & Recker, 2012). Quantitative content analysis focuses on fixed selected characteristics, such as word frequencies, to ensure a high degree of reproducibility (Boettger & Palmer, 2010). This method is based upon the occurrence of specific words and their compositions that are important indicators for the identification of hidden agendas and coherences (Breton, 2009). Quantitative content analysis is a suitable instrument for analyzing the strategic positioning of companies (Frazier, Ingram, & Tennyson, 1984; Landrum, 2008; Rutherford, 2005). The annual reports are analyzed by the frequency of buzzwords by applying this method using the software MAXQDA, a program designed for qualitative and quantitative data, text and multimedia analysis (VERBI, 2011). This study only examines the rather glossy annual reports, since they are usually filled with phrases, overstatements, platitudes or buzzwords compared to the rather simplistic form 10-k or 20-f (Stanton, Stanton, & Pires, 2004). Moreover annual reports provide transnational comparability (Clatworthy, 2005; Roberts, 2005). Due to the fact that the annual reports within the sample period

perceived a threefold increase with regard to the number of words (see table 2) the buzzwords are analyzed in relation to the length of the respective annual report.

Table 2. Mean word length of the annual reports (numbers are rounded)

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
23,512	27,018	30,266	33,380	39,484	46,412	47,504	53,055	56,179	61,141	64,064

We focus only on non-case sensitive word frequencies to avoid the problem of a biased codebook (Indulska *et al.*, 2012; Rourke & Anderson, 2004). Also, the reduction on fixed words eliminates intercoder reliability biases (Hughes & Garrett, 1990; McDavid & Hawthorn, 2006). To further explore the buzzwords we analyzed all of 102 buzzwords derived from all 3051 observations. The quantitative content analysis provides the occurrence of a single buzzword in the respective annual report, for instance BMW communicates *value-added* 61 times in their 2007 annual report. This number is then divided by the total number of words in the annual report, for instance the annual report of BMW in 2007 has 91,038 words (e.g. $61/91,038 = .000670$). This is done for all buzzwords and annual reports to derive a comparable figure. Summary statistics are provided by stating the mean values, the standard deviations and the correlations (Pearson product-moment and point biserial) coefficients in section 4. To examine if financial performance (measured in revenue) is linked to the utilization of buzzwords, we are using a mixed-effects regression model on the longitudinal data, since we can control for dependencies within the error terms (Pinheiro & Bates, 2000; Hamilton, 2009). Therefore, companies are modeled as random effects, whereas the other variables are modeled as fixed effects.

Results

Top Ten Buzzwords

Concerning RQ1, table 2 includes the top ten mean values for each year. Regarding the top ten buzzwords, the values do not vary much. For instance, the buzzwords *leadership* (ranging

from .000585 in 1998 to .000401 in 2008), *innovative* (ranging from .000230 in 1998 to .000365 in 2008) and *restructuring* (ranging from .000273 in 1998 to .000269 in 2008) represent the top three values for all years with *challenges*, *solution*, *flexible* and *unique* as followers for all years (see table 3). Especially *leadership* is the most communicated buzzword in the sample for all years, with its value being well above the others. In 1998, *leadership* was communicated twice as much as the second-most mentioned buzzword, *restructuring*. These figures are declining towards the end of the sample period, but still being well above the second most-mentioned word in 2008, *innovative*. For RQ1, we propose that:

Proposition 1. The most-used buzzwords among corporate communications are *leadership*, *innovative* and *restructuring*.

Moreover, table 2 provides evidence concerning RQ2, the most-used buzzwords are not highly volatile. This is quite surprising, since we were assuming that buzzwords are highly volatile due to a limited lifespan. The buzzwords only vary marginally over time, one exemption is *change management* which only appears in the Top Ten List in 2000. There is some variation within the numbers, for instance *flexible* varies around rank 5 to 7 in all years; with its lowest value in 2007 (.000062) and its highest value in 1998 (.000093). This implies that companies mostly rely on the same set of buzzwords. For that reason, we propose regarding RQ2 that:

Proposition 2. Companies tend to use the same set of buzzwords in their corporate communication efforts.

Table 3. Top Ten Buzzwords for each year

Rank	1998		1999		2000		2001		2002	
1	.000585	Leadership	.000508	Leadership	.000603	Leadership	.000524	Leadership	.000494	Leadership
2	.000273	Restructuring	.000282	Restructuring	.000310	Innovative	.000362	Restructuring	.000428	Restructuring
3	.000230	Innovative	.000240	Innovative	.000305	Restructuring	.000310	Innovative	.000301	Innovative
4	.000112	Challenges	.000099	Challenges	.000110	Change management	.000123	Challenges	.000119	Challenges
5	.000102	Solution	.000087	Solution	.000091	Solution	.000095	Solution	.000083	Solution
6	.000093	Flexible	.000079	Unique	.000090	Unique	.000073	Unique	.000082	Unique
7	.000072	Next Generation	.000078	Flexible	.000080	Flexible	.000070	Flexible	.000081	Flexible
8	.000069	Unique	.000055	Next Generation	.000063	Next Generation	.000067	Next Generation	.000061	Synergy
9	.000049	Value added	.000054	Value added	.000055	Synergy	.000052	Value added	.000058	Next Generation
10	.000039	Synergy	.000053	Synergy	.000052	Value added	.000052	Synergy	.000047	Value added

2003		2004		2005		2006		2007		2008	
.000423	Leadership	.000435	Leadership	.000460	Leadership	.000432	Leadership	.000424	Leadership	.000401	Leadership
.000412	Restructuring	.000332	Innovative	.000390	Innovative	.000361	Innovative	.000345	Innovative	.000365	Innovative
.000280	Innovative	.000318	Restructuring	.000274	Restructuring	.000261	Restructuring	.000236	Restructuring	.000269	Restructuring
.000126	Challenges	.000123	Challenges	.000130	Challenges	.000131	Challenges	.000133	Challenges	.000160	Challenges
.000090	Solution	.000087	Unique	.000079	Unique	.000076	Solution	.000081	Solution	.000074	Flexible
.000083	Flexible	.000075	Flexible	.000075	Solution	.000074	Next Generation	.000076	Next Generation	.000074	Solution
.000077	Unique	.000069	Solution	.000069	Flexible	.000070	Flexible	.000069	Unique	.000070	Unique
.000048	Value added	.000055	Next Generation	.000061	Next Generation	.000067	Unique	.000062	Flexible	.000067	Next Generation
.000047	Next Generation	.000047	Optimization	.000053	Transparency	.000052	Value added	.000055	Transparency	.000055	Optimization
.000047	Synergy	.000047	Value added	.000051	Optimization	.000052	Transparency	.000054	Optimization	.000053	Transparency

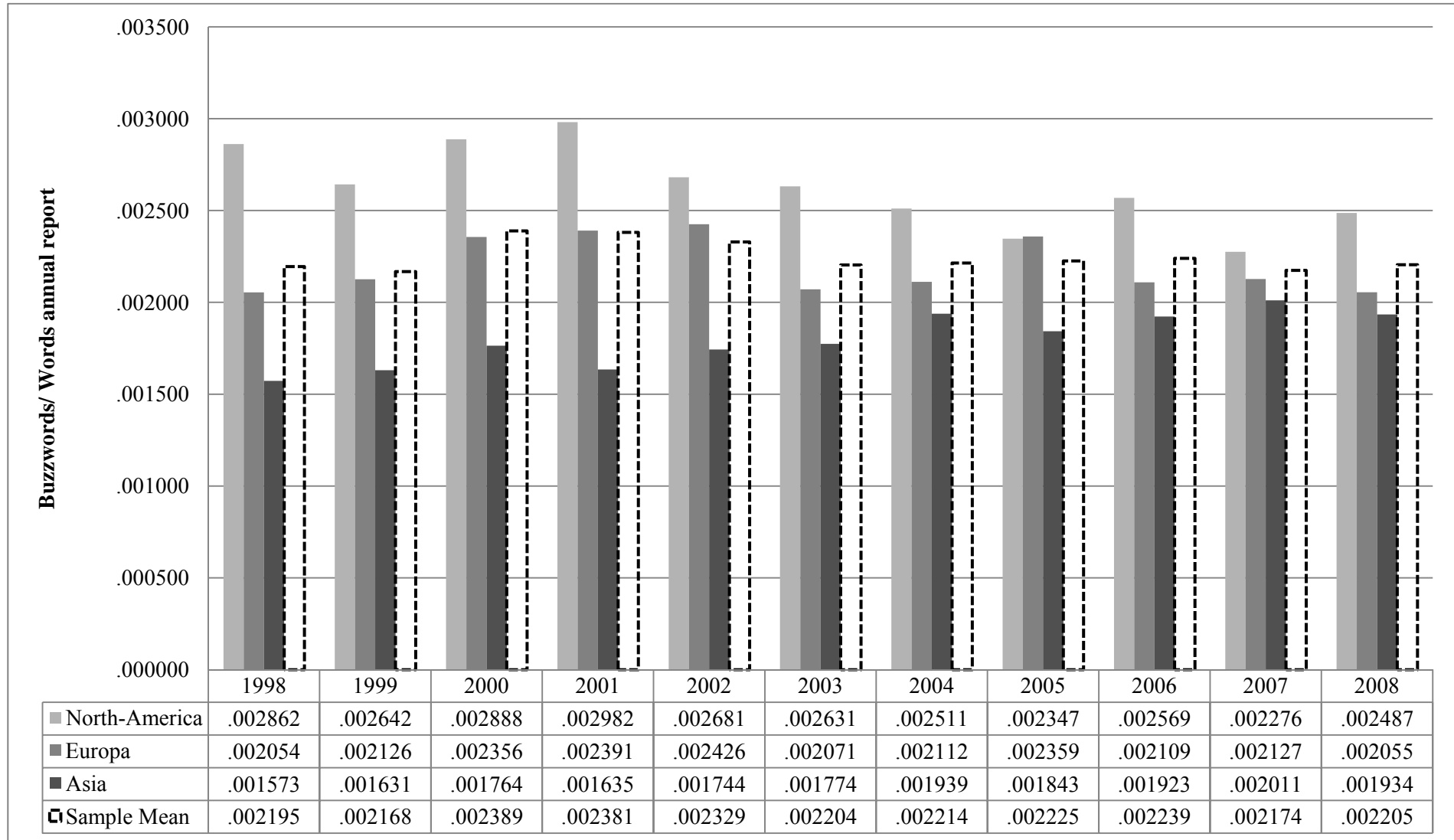
Buzzwords and their geographical reach

In figure 1 the companies within the sample are grouped into three different geographical regions: North America (135 companies), Europe (123 companies) and Asia (91 companies); 11 companies out of the 360 cannot be classified into the three major world regions. Depending on the frequencies, it can be seen that the geographical origin of the firms has an effect on the utilization of buzzwords in the annual reports (see figure 1).

The mean value for all years stands for North America with .002625, for Europe with .002199 and for Asia with .0011797. In the beginning of the sample period, in 1998, companies from North America (.002862) were using buzzwords almost twice as much than companies coming from Asia (.001573). Compared to European, North American companies were still a lot more likely to utilize buzzwords within their annual reports in 1998. This communication behavior is declining towards the end of the sample period, but the values for North American companies in 2008 (.002487) are still higher compared to Asian (.001934) or European companies (.002055) in 2008. Regarding RQ3, we put forward that:

Proposition 3. Companies from North America are much more likely to use buzzwords than European or Asian companies.

Figure 1. Buzzwords and geographical origin



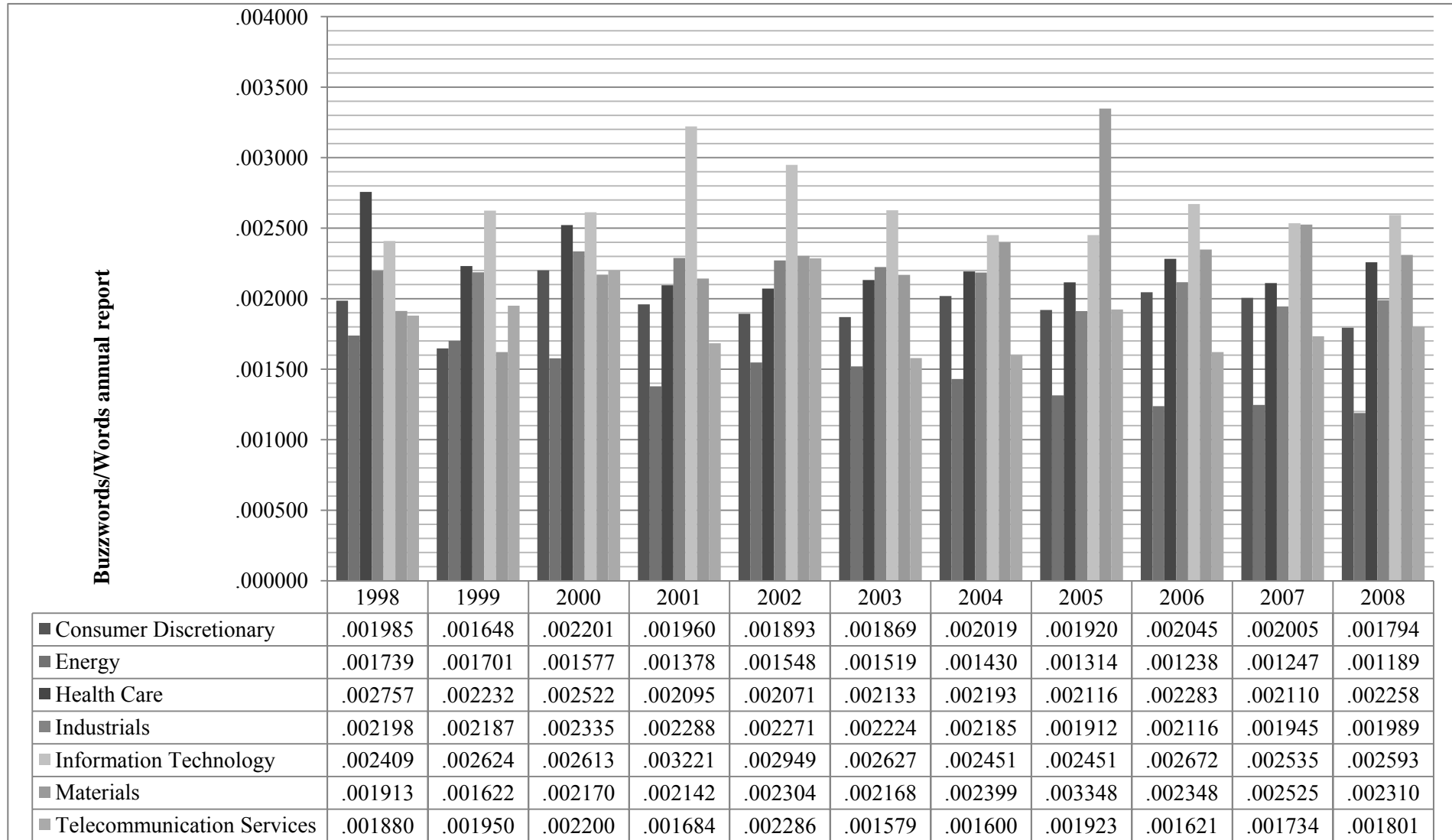
Buzzwords and Industry Sectors

To examine if the usage of buzzwords varies across industries, we grouped the firms according to the Global Industry Classification Standard (GICS). Bhojraj, Lee, & Oler (2003) provide a comparable overview on different classification schemes such as the SIC-Code or the NACIS-Code. They GICS is advantageous on numerous indices such as forecasted and realized growth rates, cross-sectional variations in valuation multiples and financial ratios. Figure 2 shows the results of the mean usage of buzzwords based on the two-digit classification of the GICS-scheme. 54 companies can be classified in the consumer discretionary, 9 in the consumer staples, 12 in the energy, 55 in the health care, 80 in the industrials, 87 in the information technology and 36 in the materials sector (see Figure 2).

The application of buzzwords differs among industries. For instance, companies in the energy sector show the lowest usage of buzzword (mean value .001444). Companies belonging to the consumer staples sector are rather generous in using buzzwords, with a mean value of .003152, which is twice as much than the energy sector. For the whole sample period, they have relatively high numbers and, for six years within the sample period, are ranked in first place. Companies in the information technology sector strongly rely on buzzwords, with a mean value of .002649. The industrials (mean value: .002150) and consumer discretionary (mean value: .001940) sectors show a relatively stable use of buzzwords in most years around the total sample mean (.002248). The results for the materials sector are mixed (mean value: .002295). In the beginning of the sample period, the numbers are rather low but increase significantly towards the end of the sample period. Based on these findings, we propose for RQ4 that:

Proposition 4. The utilization of buzzwords is industry specific and highlights quite different frequencies of use.

Figure 2. Buzzwords and industry sectors



Buzzwords and financial performance

To examine the relationship between buzzwords and firm performance, we use a set of six variables. Table 4 provides the summary statistics. The variable buzzwords, revenue and employees are all metric variables. The variables North America, Europe, Asia, accounting standard national (acc. std. national), IFRS and US GAAP are all dichotomous variables, implying the origin and the applied accounting standard of the companies. We did not include the industry sectors for further analysis, due to the skewness of the distribution (Westfall & Henning, 2013). The mean value for buzzwords is .002247 suggesting that buzzwords represent only a marginal fraction of the total number of words in an annual report. The mean values for revenue (22,637,074.43 US Dollar) and employees (62,234.95) indicate that large companies were considered, still the standard deviation (revenue: 36,896,120.65; employees: 74,565.27) of these two variables show that the values vary heavily.

Table 4. Summary Statistics; N, Means, standard deviations and correlations (Pearson product-moment and point biserial)

Variable	N	Mean	SD	Buzz- words	Revenue	Employees	North America	Europe	Asia	Acc. std. national	IFRS	US GAAP
Buzzwords	3032	.002247	.001700	1	-.034214	.006794	.151568**	-.020147	-.152374**	.016793	-.022388	.003796
Revenue	3735	22,637,074.43	36,896,120.65		1	.596125**	-.050298**	.080423**	-.028423	-.001756	.102259**	-.066870**
Employees	3425	62,234.95	74,565.27			1	-.131514**	.154970**	-.024652	.026546	.044397*	-.056438**
North America	3949	.376045	.484453				1	-.563923**	-.452371**	.072518*	.015558	-.076871**
Europe	3949	.345404	.475560					1	-.423281**	-.040738*	.034050*	.007236
Asia	3949	.253482	.435059						1	-.039546*	-.055321**	.080944**
Acc. std. national	3718	.454544	.497997							1	-.355665**	-.759976**
IFRS	3720	.132257	.338817								1	-.324868**
US GAAP	2546	.408701	.491660									1

*Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed).

The results of the correlations for buzzwords show a highly significant, positive relationship with companies originating in North America (.151568). Moreover, buzzwords are highly significantly and negatively correlated with companies originating in Asia (-.152374). Both correlations are reaffirming proposition 3.

Regarding RQ5, we were interested in whether the financial performance is related to the obfuscation of information by companies utilizing buzzwords. We test if the financial performance of our sample companies is related to the usage of buzzwords by estimating the following mixed-effects regression model (Goldstein, 2011; Hox & Roberts, 2011):

$$BW_{it} = a + \beta_1 Revenue_{it} + X'_{it}\theta + u_t + e_{it} \quad (1)$$

Where the dependent variable BW_{it} indicates the logarithmic added up value of buzzwords divided by word length for each company i (with $i = 1, \dots, 360$) in the period t (with $t = 1998, \dots, 2008$). We measure financial performance by using the revenue in US Dollars, where the independent variable $Revenue_{it}$ stands for the logarithmic revenue for the companies i in period t . X_{it} are the set of control variables: firm size (measured by employees), geographical heritage (measured by Asia and Europe) and accounting standards (measured by Acc. Std. National and IFRS). u_t are the residuals of the random-effects of the years and e_{it} are the residuals of the companies (Goldstein, 2011; Hox, 2010). The companies are modeled as random effects, whereas the other variables are modeled as fixed effects (Hox & Roberts, 2011). The results of the mixed-effects regression analysis are presented in Table 5:

Table 5. Results of mixed-effects regression^a

Parameter	Estimate	Std. error	F	t	Sig.
Intercept	-2.578132	.112025	665.282	-23.014	.000
Revenue	-.103623	.028715	961.524	-3.609	.000
Employees	.141811	.030316	939.960	4.678	.000
Asia	-.133519	.024443	490.097	-5.462	.000
Europe	-.076518	.021969	479.737	-3.483	.001
Acc. Std. National	.000952	.017279	1020.837	.055	.956
IFRS	-.007611	.021922	1195.609	-.347	.729

a: dependent variable =BW_{it}

The estimated coefficient for the variable revenue (-.103623) is significant with negative connotations, indicating that the utilization of buzzwords within annual reports is higher the lesser the revenue of the respective year. For employees, the coefficient is positive (.141811), indicating that larger companies (by employee size) tend to use more buzzwords than smaller companies. The coefficient controlling for geographical influences, shows that the origin has an effect on the application of buzzwords as well, the variables Asia (-.133519) and Europe (-.076518) provide small negative coefficients, strengthening proposition 3. The applied accounting standards do not possess a significant effect on the usage of buzzwords in annual reports. Based on these results, we propose that:

Proposition 5. Companies that perform financially weaker tend to use more buzzwords in their annual reports, strategically utilizing buzzwords to obfuscate information.

Discussion

Summary of findings

In the sample, we show which buzzwords firms tend to use mostly and that they only vary marginally over time. *Leadership*, *restructuring* and *innovation* are among the three most used buzzwords in every year, proving their popularity among corporate communications. We

show that frequency of the most used buzzwords is not volatile. We also showed that the origin and the industry of the firms have an effect on the usage of buzzwords. The fact that companies from North America are compellingly using more buzzwords than European or Asian companies, might be attributed to different cultural backgrounds or different perceptions of communications. That companies from the energy sector tend to avoid buzzwords might be attributed to the fact that the energy sector is focused on an image of stability and reliability. To the contrary, companies from the consumer staples and the information technology sector do use buzzwords quite frequently. These industry sectors operate in markets with short product- and technology life cycles, forcing them to always provide a *state-of-the-art* image.

Our findings indicate that companies which earn less tend to use buzzwords more often in their annual reports. Buzzwords seem to be important to impress external stakeholders according to our study. These results are congruent with Baker & Kare (1992), Courtis (1995), Li (2008) and Subramanian *et al.* (1993) who show that companies use textual complexity to obfuscate information, e.g. hide lower revenue. That companies with low reported revenues tend to use buzzwords more often might have several reasons: First of all, these companies may want to cover up the current performance by talking nicely. These companies might even try to put a spotlight on the positive aspects of their current performance by using buzzwords. Moreover, it can be stated that these companies are deliberately using buzzwords as a strategic instrument in their corporate communications.

Contribution to business practice and academic literature

This study demonstrates that companies with lower revenues tend to use buzzwords more often, therefore an annual report riddled with buzzwords might leave a negative impression on external stakeholders. Furthermore, companies could regard our compilation of buzzwords as words they should try to avoid or only carefully use within corporate communications. The

utilization of buzzwords as one proxy for the current and future status, might also be taken into consideration for company analysis. Evaluating the frequency of buzzwords within annual reports can be an easy approach to determine if the companies are trying to obfuscate information.

This study explores buzzwords within annual reports by quantitative content analysis and mixed-effects regression analysis. We are focusing on lifespan, geographical origin, the effect of the associated industry and the relationship between financial performance and buzzwords. To our knowledge, it is the first study that quantifies and specifically concentrates on buzzwords as an outcome of corporate communications. Previous research only described buzzwords as (mostly) negative outcome of communications, but do not determine buzzwords and its strategic usage as such. Therefore, our significant results provide a starting point for future research.

Limitations and directions for future research

Design issues present one of the main limitations of this study. Since there is no existing research on the quantitative utilization of buzzwords within the literature, we could not rely on previous work. One limitation derives from the sample design, the outcome might be affected by a different sample period. Another possible limitation of this study is related to the measurement of buzzwords. We only examined word frequencies, some authors studying lexical properties such as Li (2008). Future research might also consider different cultural backgrounds using publicly available material, such as the Hofstede dimensions examining possible relationships on the utilization of buzzwords and culture. Since we only focused on annual reports, future research will also have to include other forms of corporate communications and lexical properties to reaffirm, reject or enhance our findings.

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Appendix

Table 6. Codebook on Buzzwords (Buzzwords are analyzed non-case sensitive)

Root-Word	Alteration 1	Alteration 2	Alteration 3	Alteration 4	Alteration 5
Actionable					
alignment					
at the end of the day	at-the-end-of-the-day	end of the day	end-of-the-day		
B2B	B-2-B	Business-to-Business	Business-to-Business		
Bandwidth					
behavioural targeting	behavioural-targeting				
Benchmarking	benchmark				
Best of Breed	Best-of-Breed				
best practice	Best Practices	Best-practice	Best-Practices		
bleeding edge	bleeding-edge				
Blue sky thinking	Blue-sky-thinking	blue-sky thinking			
bottom line	bottom-line				
Bounce Rate	Bounce-Rate				
Business Objectives	Business-Objectives				
calls to action	calls-to-action	call to action	call-to-action		
Challenges	Challenge				
Change management	Change-management				
circle back	circle-back				
client focus	client-focus				
Core competency	Core competencies	Core-competencies	core-competency		
Crossplatform	Cross-platform	Cross Platform			
customer centric	customer-centric				

Cutting Edge	Cutting-Edge		
deliverables			
demand creation	demand-creation		
Disintermediate			
disruptive			
Downsizing	Down-sizing	downsize	
Dynamic			
Empower	empowering		
engagement metrics	engagement-metrics		
flexible	Flexibility		
Game changer	Game-changer	gamechanging	game-changing
going forward	going-forward		
ground breaking	ground-breaking		
heads up	heads-up		
in the loop	in-the-loop		
Incentivize			
incremental	Incremental Improvement	Incremental-Improvement	
Innovative	Innovation		
Intuitive	Intuition		
key performance indicators	key-performance-indicators	key performance-indicators	key-performance indicators
Knowledge economy	Knowledge-economy		
leading	Leader	Leadership	
leading edge	leading-edge		
Lean			
Lessons Learned	Lessons-Learned		

Leverage					
lifelong value	lifelong-value	life-long value	life-long-value		
longtail	long-tail	long tail			
lowhanging fruit	lowhanging-fruit	low hanging fruit	low-hanging-fruit		
metrics					
mission critical	mission-critical				
Multitasking	Multi-tasking				
next generation	next-generation				
on the same page	on-the-same-page				
Optimization	optimize				
Organic Search	Organic-Search				
out of the box	out-of-the-box				
Outside the Box	Outside-the-Box	think outside the box	thinking outside the box	think-outside-the-box	thinking-outside-the-box
outsourcing	outsource				
paradigm					
Paradigm Shift	paradigm shifting				
Personalization	personalize				
Proactive					
Reach out	Reach-out	reaching out	reaching-out		
RealTime	Real Time	Real-Time			
Reengineering	reengineer				
relationship marketing	relationship-marketing				
Relevance					
Repurpose	repurposing				

Reskilling	reskill	Re-skill	
Restructuring	restructure		
revolutionary			
Rightsizing	rightsize	right-size	right size
Robust			
scalable			
Seamless			
Segmentation			
semantic mapping	semantic-mapping		
Share of Voice	Share-of-Voice		
Social Media	Social-Media		
solution			
state of the art	state-of-the-art		
streamline	stream line	stream-line	streamlining
synergy	synergies		
take it to the next level	taking it to the next level	take-it-to-the-next-level	taking-it-to-the-next-level
Thought leader	Thought-leader		
Torso			
Touch base	Touch-base		
Transparency	Transparent		
trend analysis	trend-analysis		
turnkey			
unique			
Value added	Valueadd	Value-added	Value-add
value proposition	value-proposition		
Value Stream	Value-Stream	value streaming	value-streaming

viral	viral marketing	viral- marketing
Visibility		
win-win	win win	
Workflow	Work flow	Work-flow
world class	world-class	worldclass

Essay IV:

The evolution of Innovation: A lexical perspective

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Status: *Veröffentlicht in: Innovation Journalism, Vol 9. No 1. September 2013, 1-22.*

The evolution of Innovation: A lexical perspective

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The evolution of Innovation:

A lexical perspective

This paper empirically addresses the notion that the word Innovation has been overly used by utilizing a quantitative content analysis on approximately 3.7 billion news documents in LexisNexis. The sample period ranges from 1980 to 2010 and altogether encompasses 2,013,143 documents containing the word Innovation, showing that the importance of the word Innovation has progressed by 132.62% over the entire sample period. From 1980 to 1994 the occurrence of Innovation remained relatively constant, while in 1995 the importance of Innovation apparently begins to rise to the year 2000 when it reaches its peak. In 2001 the occurrence of Innovation begins to decline slightly, but advances towards the end of the sample period again. In general, these findings indicate that the word Innovation has been mentioned quite more often within the last decades, reaching its peak of usage around the turn of the millennium, providing useful insights for journalists and corporate communications experts.

1 Introduction

Innovation is frequently acknowledged as the source of growth and organizational renewal and regarded as a major source of an organization's competitive advantage (Schumpeter, 1950; Porter, 1990). The literature on innovation as such is vast and covers countless articles on innovation regarding its analysis, its methods, best practices, perspectives, typologies or objectives (Freeman, 1994; John and Snelson, 1988; Rothwell, 1992; Lilien and Yoon, 1989; Van de Ven et al., 1999; Cooper, 1990; Barclay, 1992; von Hippel, 1988; Craig/Hart, 1992; Miles/Snow, 1978). One aspect of Innovation, though, has been studied just by a few authors and mainly in the German speaking literature (Zerfaß/Huck, 2007; Brem et al. 2010; Eberl, 2009, Vetter, 2007): The communication of Innovation. The communication of innovative products, services or technologies is supposed to encompass the innovation process and to promote the diffusion of Innovation (Mast et al. 2005).

Still, the communication of Innovation cannot be considered unbiased, since the word Innovation is one of the most often used words in corporate communications as such (Berkun, 2007). It is even said that Innovation as such is one of the most overused words in business and management (Mast et al. 2005; Wall Street Journal, 2012; Pontefract, 2013; Business Week, 2008). Overused words may lose their effectiveness with the recipient, while effective communications should avoid these words (Krizan et al. 2008). Or as Andy Grove, former Chairman of Intel puts it (Jain et al., 2010, p.238):

"The word innovation has become overused, clichéd and meaningless"

Though, after a comprehensive literature review there is no empirical insight into how the word Innovation has been used or how overused it really is. This paper addresses this research gap by questioning how the word innovation itself has progressed over the last decades and through which channels it was communicated. It is intended to increase the knowledge regarding the usage of Innovation in journalism or in corporate communications. Journalists or communication experts may use the insights provided by this paper while communicating Innovation in any possible way.

This paper is constructed as follows. I provide a literature review regarding the communication of Innovation, the lexical properties as such and the content analysis as a research method in business & management. The methodology part elaborates on the quantitative content analysis as a research method and describes the data collection. Afterwards the results of this study are presented. The paper

proceeds with a discussion of the results, provides some limitations, implications and comes to an end with a conclusion.

2 Literature Review

2.1 The Communication of Innovation

From a company perspective, the communication of the innovative performance or their innovativeness to internal and external stakeholders serves several functions (Zerfaß/Huck, 2007). To internal stakeholders the communication is supposed to create awareness for innovation matters (Mast et al. 2005), motivate staff (Greg, 2012), create an innovation culture (Benner/Tushman, 2003; Zahra et al. 2000) cross-pollinate ideas and knowledge during the research, development and application stages (Estrin, 2009) and to keep up employee loyalty or retention (Scott, 2001). The external communication of Innovation aims at the creation of building an innovative image (Zboralski/Gemünden 2009) creating trust between individuals and trust between institutions and industries (Luoma-aho/ Halonen, 2010) to overcome possible fears and concerns regarding novelties or alterations (Zerfaß/Huck, 2007) and to reduce uncertainty among various stakeholders (Fidler/Johnson, 1984; Harri, 2012).

Innovations, especially Product Innovation, are sometimes highly complex with a strong degree of abstraction, leading to possible reluctance and constraints from its potential customers, which in turn hampers the diffusion of Innovation (Georgy/Mumenthaler, 2012). The goal of the communication of Innovation should be to confront all stakeholders, for instance customers and suppliers, from an early stage with the alterations and changes of the innovation (Zerfaß/Möbblein, 2009). Mast et al. (2005, p.4) define Innovation Communication as:

“symbolic interactions between organizations and their stakeholders, dealing with new products, services, and technologies”.

Furthermore Zerfaß et al. (2004) argue that the communication of Innovation is the systematically planned, executed and evaluated communication of Innovation with the goal to create empathy and trust in the innovation. Moreover, it is meant to position the organization itself as an Innovator. The link between Innovation and Communication has been established earlier though (Ruppel/Harrington, 2000). In general, communication is regarded as a central success factor for innovations (Moenaert et al., 2000; Sivastava/Moreland, 2012; Johnson/Chang, 2000). For these reasons, communication is an overreaching function that needs to be taken care of throughout the whole innovation process (Moenaert et al., 2000; Nordfors, 2006; Wells, 2008; Conway, 1995).

2.2 The lexical dimension

The development or usage of words as such has been studied intensively (Keil/Batterman, 1984; Metsala, 1997; Halberda, 2003; Rudell, 1993). For instance, frequently used words evolve at slower rates and infrequently used words progress more at a speed (Pagel et al., 2007). The progression of words as such concerning its usage and definition has also been addressed by literature. One example being Gest (2001), he studies the evolution of the word *photosynthesis*. Or for instance Uskali/Nordfors (2007) who study the evolution of the metaphor Silicon Valley in American journalism by examining US-mainstream media coverage during the 1970s and the beginning of the 1980s. Neumann et al. (2010) examine the dynamics of certain buzzwords by analyzing their appearance in internet blogs. Since they cannot assess the true number of blogs, they try to approximate this figure by measuring the number of appearances of the word “The” in blogs across the

sample period. They find that the growth rate of buzzwords is exponential and higher than those of the internet blogs, indicating that buzzwords grow faster than neologisms and well-established words. Certain words tend to become popular for a certain life span, therefore most words can be associated with a certain lifecycle (Davis, 2012). This holds especially true for certain concepts, paradigms or strategies within the business and management context (Ketchen et al., 2008; Chaharbaghi, 2007).

Within business and management literature, most research has been dedicated to the development of terms or concepts, therefore these studies can be classified as epistemological studies. For instance, Bracker (1980), Evered (1983) or Barney (1997) examine the progression of the *strategy concept* based on varying definitions. Each one of these studies is concerned with regularities among the definitions and afterwards providing a new synthetic definition. Furthermore, Ronda-Pupo and Guerras-Martin (2012) make clear how the lexical composition of *strategy* has changed over the period of 1962-2008. They show the growth of internal consistency, the centrality degree of the key terms, e.g. with most mentioned nouns being *firm*, *goals*, *process* and *actions*. Furthermore they show that this development has fostered the emergence of new research topics. Keupp et al. (2011) remark that the state of knowledge or the lexical definition regarding the *strategic management of innovation* is conflicted with theoretical inconsistencies, contradictory predictions and persisting knowledge gaps. They utilize among other research methods co-word analysis, suggesting future theory developments and providing decisions polices for practitioners.

Content analysis as a research method has been applied by several researchers to the Business and Management literature. This study concentrates especially on literature with a technology, R&D or innovation focus, because these studies accommodate a certain innovation context. Most studies that utilize content analysis in this context, examine papers regarding developments of theories and concepts. In this line of research are Papastathopoulou and Hultink (2012) or Page and Schirr (2008), who examine the New Service Development, Anderson et al. who (2004) explore the facilitators of innovation, Baregheh et al. (2009) appraise a multidisciplinary definition of innovation, Dahlander and Gann (2010) try to clarify the “openness” in open innovation.

Other researchers who apply content analysis are Droge et al. (2010), who examine the Blogs of lead users and early adopters concerning New Product Development, Gerhard et al. (2011) screen advertisements of high-technology products, Entwistle (1999) analyses the R&D disclosure in annual reports, Albino et al. (2012) study the influence of the adoption of environmental strategies on green product development, Pan and Zhang (2011) measure the innovativeness of product-specific reviews, Ceci and Iubatti (2012) examine the innovation diffusion in SME networks, Howell and Boies (2004) measure the creation and promotion of ideas in the innovation process, Wibon (2002) studies how the technology management influences the initial public offering of high-technology firms.

Still, empirical studies concerning the word Innovation could not be found after a comprehensive literature review process. The literature review included the following databases: Business Source Premier, JSTOR, Google Scholar, Microsoft Academic and the International Bibliography of the Social Sciences, Bibliography of Linguistic Literature and the Encyclopedia of Language and Linguistics, yet no similar research approach could be brought to light.

3 Research methodology

This study is supposed to examine a wide range of documents without any prior focus considering the utilization of the word *Innovation*. For that reason LexisNexis seems to be a suitable database, since it entails one of the world’s largest electronic database for legal and public- records related information (LexisNexis, 2012). In 2013, more than 6 billion documents from more than 45,000 different sources

were available. Moreover, LexisNexis provides the possibility of searching and then ordering into various media categories.

3.1 Measurement

A quantitative content analysis of the documents concerning the exact citation of the word “Innovation” was conducted. Content analysis as a research method is a systematic and objective technique to describe and quantify phenomena in the social sciences (Downe-Wamboldt, 1992; Krippendorff, 1980; Sandelowski, 1995). Holsti (1969, p.14) provides one of the most mentioned definitions:

“Content analysis is any technique for making inferences by objectively and systematically identifying specified characteristics of messages”.

The quantitative part focuses on fixed selected characteristics, such as word frequencies, to ensure a high degree of reproducibility (Neuendorf, 2002; Elo/Kyngäs, 2008). This implies that the method is a reductionist, with sampling and measurement procedures that reduce information media to manageable data, from which inferences may be drawn about phenomena themselves (Riffe et al., 2005). This is based upon the thought that the occurrence of certain words can be important indicators for the identification of hidden agendas and motives (Breton, 2009; Frazier et al., 1984; Landrum, 2008; Rutherford, 2005). Only documents which entailed the exact word “Innovation”, no abbreviation or other alteration were considered for this study.

The data collected represent time series data, which implies that any further analysis requires stationarity of the data (Woolridge, 2009; Lindner, 2009). Stationarity as such means that the joint distribution of a time series is invariant under time shifts (Tsay, 2010; Seddighi, 2000). For that reason I apply an augmented Dickey–Fuller test, testing for stationarity (Kennedy, 2003).

An interesting aspect of time series analysis is concerned with the temporal fluctuation and the past dependencies of the data (Turchin/Ellner, 2002; Yaffee/McGee, 2000). A linear regression is therefore executed to investigate if the specified data of one year is influenced by the past year (Guess/Farnham, 2000). A major problem with times-series data is that the residuals are often correlated with nearby residuals, which is called autocorrelation (Albright et al., 2011; Brocklebank et al., 2003). For that reason, I check for the Durbin-Watson statistics, which controls for autocorrelation (Wang/Jain, 2003; Bajpai, 2010). It is scaled between 0 and 4, where values close to 2 indicate very little autocorrelation. Values below 2 indicate positive and above 2 indicate negative autocorrelation (Baltagi, 2011; Anderson et al., 2009).

3.2 Data collection

This study focuses on the communication of Innovation in different media genres. For that reason, the News segment of LexisNexis was taken into further consideration. The search term was set on *Innovation*, while the option “All English Language News” was chosen. This study tries to take an unbiased perspective on *Innovation*, while specifically leaving out the inconsistencies and different perceptions on the subject among scholars, e.g. Baregheh et al. (2009). The option “All English Language News” covers exactly 3801 sources (as of December 2012), covering all world regions. The wide coverage includes the *Ukrainian Economic Statistics*, *The Washington Post*, *Sunday Herald*, *Sunday Observer* (Sri Lanka), *Pakistan Law Reporter*, *Kashmir Observer*, *Esquire*, *El Paso Times*, *Australian Financial Review* or the *Africa Energy Intelligence* just to provide a few examples.

The sample period ranges from 1980 to 2010 and was determined by two factors. First, before 1980, only few articles containing *Innovation* were available. Second, the inquiry function in LexisNexis is limited to 3,000 documents and the smallest period in which the LexisNexis News query can be set, is

on a daily basis. For instance, on the 8th of March 2010, 1,264 documents, containing the word Innovation were in the database. On most days of 2011 there were more than 3,000 documents within the News Segment containing the word Innovation; therefore a comprehensive elevation was not possible any more. After countless single inquiries, the numbers were aggregated on a yearly basis. Conclusions regarding the real importance or development of Innovation can only be made with the number of the entire documents within the News Segment in mind. Since these figures were not freely available through the inquiry function, the Support Chat was consulted. After sending out dozens of E-Mails only data for the years 1980 -1997, 2000, 2005 and 2010 were provided by the Support Chat staff. Therefore the missing data had to be approximated. One possibility of estimating missing data represents the approximation via regression analysis (Karris, 2007; Liengme, 2009). For that reason, multiple estimations via different mathematical functions were applied on the existing data; selected functions and the associated R-squared values can be taken from table 1.

Table 1: Approximation of missing data

Functions	R-Squared Values
Linear	.7844
Exponential	.9836
Polynomial	.9795
Logarithmic	.4212
Power	.8719

The exponential function provided the highest R-squared value with 0.9836. This value is close to 1, which means it is a very close approximation to the actual values (Winston/Albright, 2009; Etheridge 2010). As a consequence the approximated values are very close to the missing values, meaning that further estimations or calculations based on these results are highly reliable (Wolfram, 2003; Turchin/Ellner, 2002).

In a next step, the documents containing innovation were classified into the following media categories: Newspapers, Newswires & Press Releases, Industry Trade Press, Magazines & Journals, Newsletters, Webbased Publications and Blogs. These seven media categories account for over 80% of the entire documents within the news segment. Unfortunately, no figures concerning the distribution of the media categories could be found; therefore no assumption about the importance or development of innovation within the media categories can be made. Only conclusion regarding the channels of communications can be made. The whole data set was compiled during September till December 2012.

4 Results

4.1 The evolution of Innovation

The numbers of the documents containing Innovation are displayed in the first row of table 2. The second row shows the entire documents within the News Segment, whereas the last row exhibits the percentage of documents within the News Segment encompassing the word *Innovation*.

First of all a huge increase over the entire sample period in the documents embodying *Innovation* and the entire documents becomes easily apparent. In 1980 2,342 documents embodied Innovation, whereas in 2010 this number rose sharply to 273,204 documents. This equals a tremendous percentage

rise of 11,565.41%. Accordingly, a rise of the total documents can be recognized as well. The numbers rise from 633,754 in 1980 to 48,140,865 in 2010, which equals a percentage rise of 7,496.14%. This implies that - regarding the entire sample period - the number of documents containing Innovation has risen much faster than the entire documents within the LexisNexis News Segment. Overall the content analysis has brought to light 2,013,143 documents containing the word Innovation, whereas the News segment entails approximately 3.7 billion documents. This implies that the mean percentage share for the entire content analysis is around 0.0054.

Regarding the relative values, some variations within the numbers can be observed, too. From 1980 to 1994 the numbers range around 0.003% with the lowest value in 1985 with 0.0030% and the highest value with 0.0037% in 1994. In 1995 (0.0051%) the numbers begin to rise constantly, with the minor exception in 1996 with 0.0044%, to 2000 when it reaches its peak with 0.0086%. This is more than double the average values in the years 1980 to 1994, representing a sharp increase. From 1980 to its peak in 2000, the relative importance of Innovation in the news segment has risen about 132.62%. After 2000 the percentage share of documents embodying the word Innovation begins to fall, slowly but constantly. In 2001 it is still high with 0.0083%, but after 2006 the values stabilize around 0.004%. Towards the end of the sample period the values begin to rise slightly again with 0.0057% in 2010.

Table 2: Innovation in LexisNexis – News Segment

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Innovation	2,342	3,007	3,057	3,538	4,392	4,912	5,847	7,111	8,398
Entire Documents	633,754	800,737	894,520	1,132,264	1,185,844	1,614,806	1,812,920	2,186,636	2,453,564
Percentage share	0.0037	0.0038	0.0034	0.0031	0.0037	0.0030	0.0032	0.0033	0.0034

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Innovation	9,300	10,353	12,105	16,356	18,421	23,089	32,000	38,731	52,872	68,123	82,848
Entire Documents	2,832,132	3,469,030	3,735,342	4,664,032	5,190,730	6,293,122	6,234,976	8,790,723	9,867,216	9,267,665	10,631,608
Percentage share	0.0033	0.0030	0.0032	0.0035	0.0035	0.0037	0.0051	0.0044	0.0054	0.0074	0.0078

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Innovation	104,844	116,815	114,249	113,007	128,371	125,382	123,679	144,144	166,888	195,758	273,204
Entire Documents	12,196,285	13,991,240	16,050,362	18,412,530	21,122,343	24,230,966	27,797,092	31,888,052	36,581,089	41,964,810	48,140,865
Percentage share	0.0086	0.0083	0.0071	0.0061	0.0061	0.0052	0.0044	0.0045	0.0046	0.0047	0.0057

In regard to the assumption of stationarity an augmented Dickey–Fuller is executed, with the Akaike criterion being the default. The results are not able to reject the null hypothesis, the time series is non-stationary. A way to treat this problem is to apply the Dickey-Fuller test on first-difference, which means the data is integrated in order 1 (Woolridge, 2009; Verbeek, 2008). The lag length according to the Akaike criterion was zero, with a maxlag of 10, the results are pictured in table 3.

Table 3: Augmented Dickey-Fuller Unit Root Test

		t-statistic	Prob*	Durbin-Watson
Augmented Dickey-Fuller Test statistic		-3.985	0.004	1.966
Test critical values	1% level	-3.678		
	5% level	-2.968		
	10% level	-2.622		

*MacKinnon (1996) one-sided p-values

The results ($t = -3.985$; 1% level = -3.678 ; 5% level = -2.968) are sufficient enough to reject the null hypothesis of the Dickey-Fuller test that the times series has a unit root. The results indicate that the first difference of the non-stationary variable is stationary, which means that the variable *per_sh* is integrated of order one. Accordingly, further regressions have to be carried out on variables of the same order of integration (Mukherjee, 1998). Regarding the autocorrelation, the Durbin-Watson statistic (1.966) is close to 2, which indicates that the successive residuals are positively correlated, but do not cause any concern (Field, 2009; Stamatis, 2012). Regarding the past dependencies of data, I executed a linear regression; the results can be taken from table 4. The dependent variable is *per_sh*, which entails the percentage-share of documents containing Innovation in one year, the independent variable is *per_sh_t-1* the percentage-share of documents containing Innovation in the previous year.

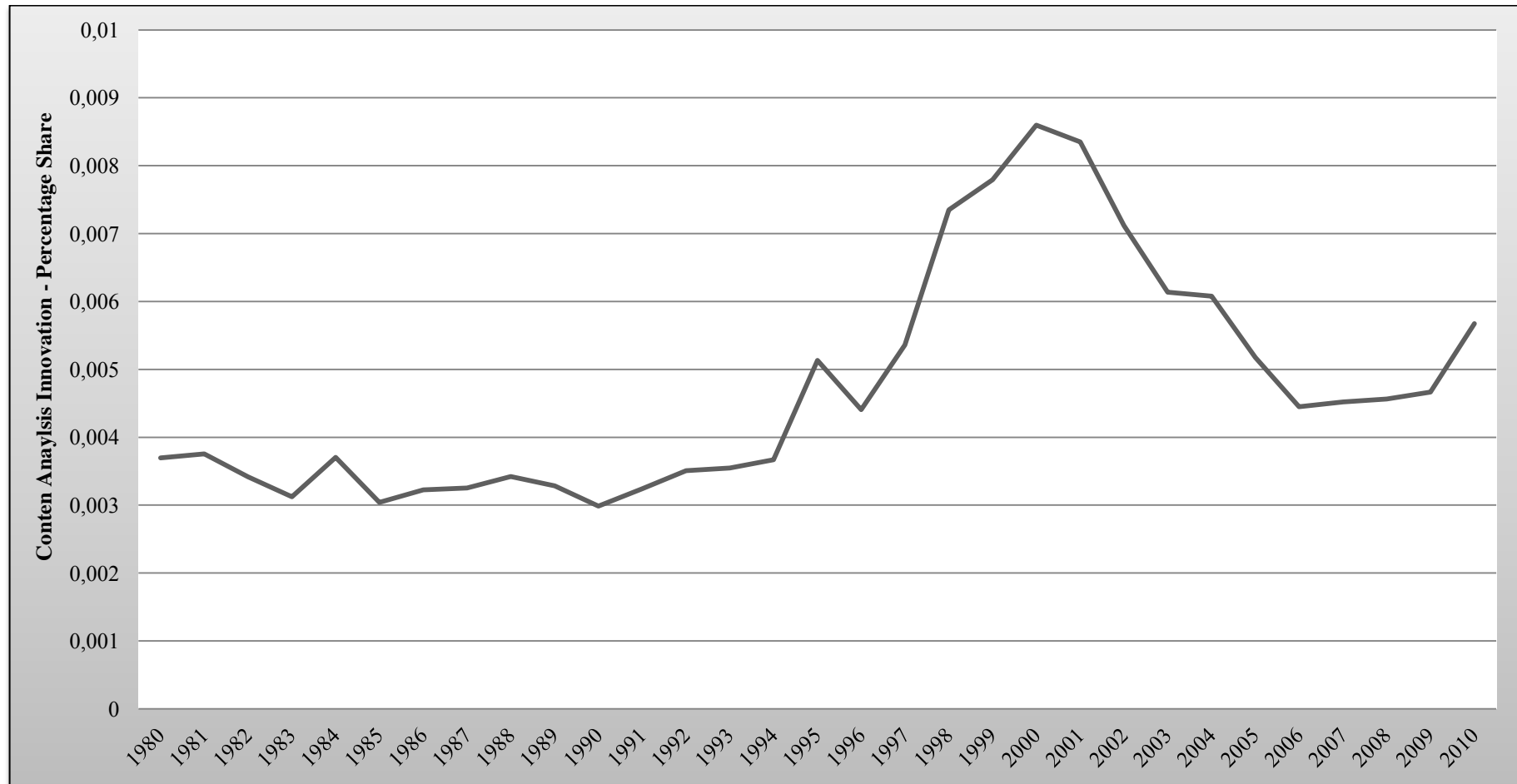
Table 4: Model Summary, N = 30; DV = *per_sh*; IV = *per_sh_t-1*

R-Square	β	F-Value	T	Sign.
.832	.911	138.743	11.779	.001

The results of the regression indicate that the percentage share of Documents containing Innovation of one year explain 83.2% of the variance of the percentage share of Documents containing Innovation of the next year ($R^2 = .832$, $F(1,29) = 138.743$, $p < .01$). It was found that the percentage share of the preceding year significantly predict the percentage share of the current year ($\beta = .911$, $p < .01$).

The evolution of the communication of Innovation can be comprehended in Figure 1; it easily shows that the usage of the word Innovation reaches its peak around the millennium.

Figure 1: The evolution of Innovation from a lexical perspective

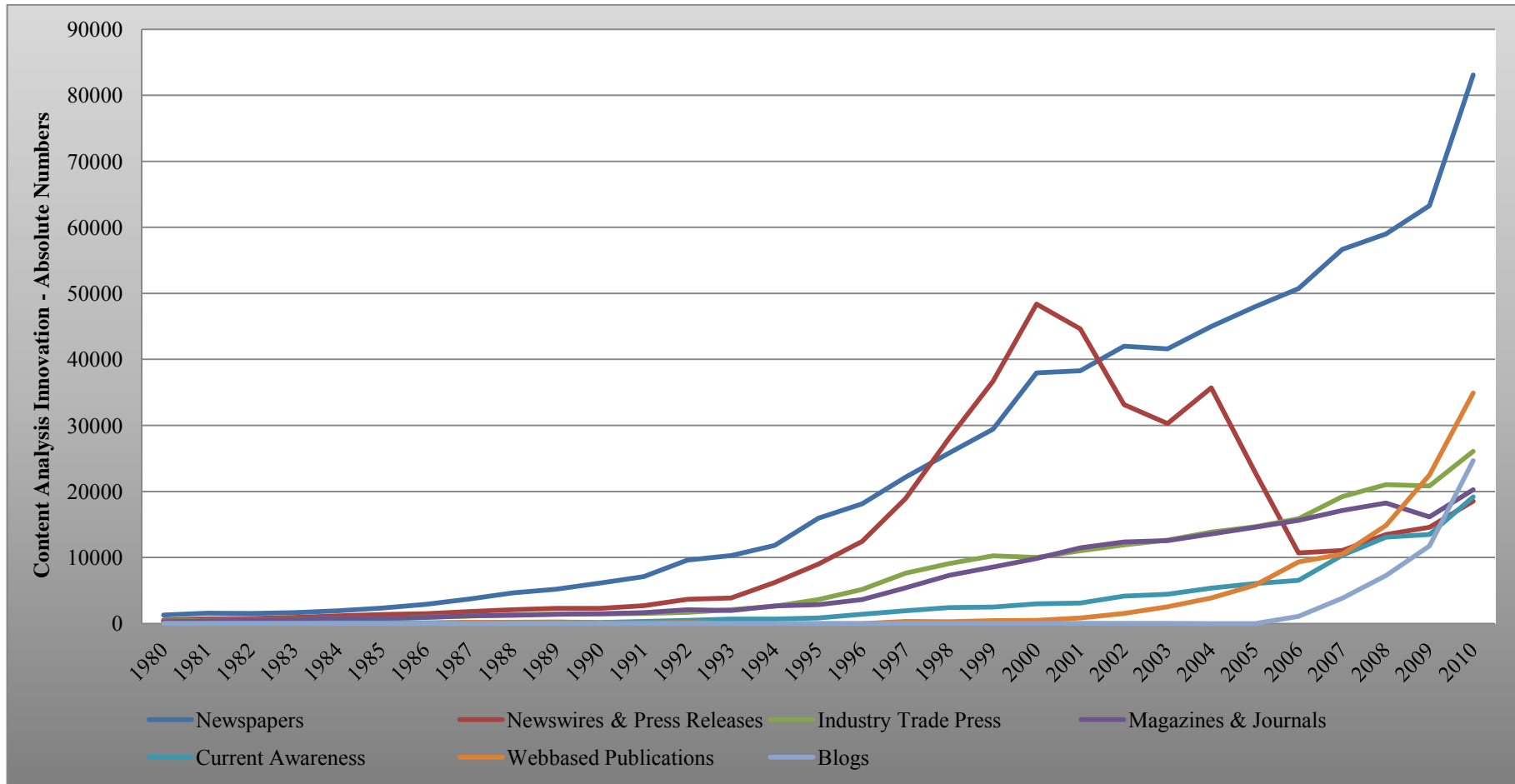


4.2 Communication channels

The results of the quantitative content analysis can also be grouped into seven different media categories: Newspapers, Newswires & Press Releases, Industry Trade Press, Magazines & Journals, Newsletters, Web based Publications and Blogs. According to LexisNexis (2013) the Section Newspaper entails the publishing of mostly daily broadsheet and tabloid newspapers, for instance the London-based *The Daily Telegraph*. Newswires & Press Releases encompass news agencies which supply or report news to other form of news organization. One example of this category is *Business Wire*. The Industry Trade Press provides information and services especially designed for business, for instance *Reed Business Information*. Magazines & Journals are usually published on a regular schedule such as the weekly *New York*. Newsletters are regularly distributed publications by profit and non-profit organizations, one example being the *Washington Drug Letter* of the US-Food and Drug Administration. Whereas the former media categories described account for the classical offline media, the latter represent the online media content. Web-based Publications explicate solely the online appearances of any media, such as *cnm.com*. Blogs consist of online journals and web applications that provide an area for the posting of individual comments and replies.

Figure 2 displays the results of the quantitative content analysis grouped into the above described media categories. The figure contains only absolute numbers, no assertion concerning the progression of the word Innovation can be made, only the distribution of the results are depicted. The curves for all media categories start up very slowly, due to the fact that compared to later years just very few documents could be found in LexisNexis. The major curves represent the Newspapers and Newswires & Press Releases. Most documents can be found in these two categories. Between 1980 and 1984 the curves for all categories are almost nonexistent. In 1985 the curves for Newspapers and to a minor extent Newswires and Press Releases begin to take off. Between 1985 and 1996 most Innovation-related Documents could be found within the Newspapers categories. In the years between 1997 and 2001 most documents were identified in the Newswires and Press Releases category. In 2002 this curve sharply declines, receives a little hike in 2004, then declines again and constantly progresses after 2006. The curves for Industry Trade Press, Magazines & Journals, Newsletters play only minor roles from 1980 to 1994, in 1995 they begin to rise slowly but steadily towards the end of the sample period. Concerning the online publications, the Webbased Publications curve begins to rise in 2001, whereas the Blogs begin to gain relevance in 2006 and constantly progress towards the end of the sample period.

Figure 2: Communication Channels of Innovation



5 Discussion and Conclusion

This study examined the utilization and therefore the progression of the word Innovation within the News Segment of the database LexisNexis in the years 1980 to 2010. Furthermore, it showed the different communication channels regarding news containing Innovation, whereas in LexisNexis Innovation is predominately communicated via Newspapers and Newswires & Press Releases. It is the first study that empirically investigated the usage and development of Innovation as such. I showed that there was a huge increase of communicating Innovation between 1980 and 2010. The utilization of Innovation reaches its peak around the millennium and declines afterwards, just to rise again in 2010.

The literature states that certain concepts, paradigms or buzzwords have a certain lifespan and that their usage varies over time (Ketchen et al. 2008; Chaharbaghi, 2007). Moreover the word Innovation has been cited as overly used (Pontefract, 2013; Jain et al., 2010). I showed with this study, that this assumption might hold true for the late 1990s and early 2000s. But for the 1980s and between 2002 to 2009 Innovation appears to be not as overused as it has been stated within popular media or academia. Especially in the year 2000 Innovation apparently seems to be a highly prominent word. This might be attributed to the fact that around the turn of the century a lot of the media were focused on the millennium itself and were reporting about possible future innovations that were expected in the years to come. Interestingly in the last year of this study, Innovation was gaining momentum again. Unfortunately, the database of LexisNexis cannot provide searches that could capture the further development. This study provides new knowledge to the field of word development, since it simply adds another subject (*innovation*) to the research community.

One limitation of this study represents the focus on LexisNexis, which might bias the finding. Another limitation of this study represents the research design, only the exact match of Innovation was measured; possible abbreviations or variations such as *innovative* were not considered. Furthermore, the lack of a benchmark might hamper the possible implications for (corporate) communications.

Future research should compare the development of Innovation to other business and managements words, paradigms or concepts, for instance *leadership*, *cost reduction* or *transparency*. The current results could be examined with regard to other sources, such as the development of Innovation in annual reports or academic journals. Moreover, the results could be compared to overall economic developments, like economic crisis or other media developments like the advancement of the digitization. Also, it would be interesting if databases such as LexisNexis could include functions and services which facilitate such research approaches in the future.

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Essay V:

Shedding some light on the Dark Matter of Competition: Insights from the Corporate Entrepreneurship Literature for the consideration of Diversity Aspects in Merger Review

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Status: *Präsentiert auf der AEDE Granada, 26-27 Juni, 2013, Spanish Association of Law and Economics, 1-27.*

SHEDDING SOME LIGHT ON THE DARK MATTER OF COMPETITION:
INSIGHTS FROM THE CORPORATE ENTREPRENEURSHIP LITERATURE FOR THE
CONSIDERATION OF DIVERSITY ASPECTS IN MERGER REVIEW

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ABSTRACT

An increased concentration of the competitive structure with respect to innovation competition will also reduce the variety of heterogeneous entities which are currently undertaking R&D or which are well situated to undertake R&D in a certain field. In combination with high entry barriers for the participation in the process of innovation competition, the consequential reduction of “diversity” can be detrimental to innovation because it reduces the number of independent sources for possible future innovations and might furthermore lead to an alignment of formerly different R&D programs. However, if “diversity” indeed benefits innovative performance, even merged firms should have an intrinsic incentive to maintain it in-house. Therefore, this article aims to bring to light whether firms have indeed such an incentive to consider the creation or preservation of “diversity”. By focusing on the “Corporate Entrepreneurship” literature we will demonstrate that the idea of a creation of independent entities within the firm is indeed considered as an important determinant for the innovativeness and general performance of firms. Nevertheless, we will also show that this strategy has several grave implementation problems and might be hampered by certain conflicts of interests. As a consequence, competition authorities cannot presume that a reduced “inter-firm diversity” will get substituted by an increased “intra-firm diversity” by itself.

JEL: B52, K21, L4, M1, O31, O32

I. INTRODUCTION

The adequate consideration of innovation aspects in merger review was, and still is, one of the most controversially discussed issues among antitrust scholars.¹ A particularly critical aspect

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¹ See Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569 (1995); Richard T. Rapp, *The Misapplication of the Innovation Market Approach to Merger Analysis*, 64 ANTITRUST L.J. 19 (1995); Robert J. Hoerner, *Innovation Markets: new Wine in old Bottles?*, 64 ANTITRUST L.J. 49 (1995); George A. Hay, *Innovations in Antitrust Enforcement*, 64 ANTITRUST L.J. 7 (1995); Howard M. Morse, *The Limits of Innovation Markets*, 2 ANTITRUST

of this discussion deals with the question whether a more or rather a less concentrated competitive structure (mostly narrowed to market structure) is beneficial for innovation.² However, until to date, theoretical³ as well as empirical⁴ contributions delivered rather contradictory results in the sense that they support the proposition that a highly competitive just as much as a more concentrated competitive structure can basically spur innovation. Hence, from this perspective, it is not clear whether a merger, which leads to a higher concentration of the competitive structure, is detrimental or maybe even beneficial for innovation.

However, while mainstream economics focused almost exclusively on the likely effects of a change of the competitive structure on the firms' incentives to invest in R&D and the abilities to innovate, a change of the competitive structure might also have an additional effect on innovation. This effect originates from the fact that a merger, which causes a reduction of the number of innovation competitors, can also harm innovation because it reduces the variety of heterogeneous entities which are currently undertaking R&D or which are well situated to undertake R&D in a certain field. This reduction can be detrimental to the overall innovativeness of an industry when we consider firms as being different with respect to their resources, their organizational structure, their business culture and the way how they do business.⁵ As soon as we allow for these differences, it is appropriate to regard each firm as an entity which has unique capabilities and individual beliefs about the most promising way

& INTEL. PROP. (ABA SECTION OF ANTITRUST LAW NEWSL.) 22 (2001); Dennis W. Carlton & Robert H. Gertner, *Intellectual Property, Antitrust and Strategic Behavior*, in 3 INNOVATION POLICY AND THE ECONOMY 29 (Adam B. Jaffe et al. eds., MIT Press 2003); Robert W. Davis, *Innovation Markets and Merger Enforcement: Current Practice in Perspective*, 71 ANTITRUST L.J. 677 (2003); Michael Katz & Howard Shelanski, *Mergers and Innovation*, 74 ANTITRUST L.J. 1 (2007); Josef Drexl, *Anti-Competitive Stumbling Stones on the Way to a Cleaner World: Protecting Competition in Innovation without a Market*, 8 J. COMP. L. & ECON. 507 (2012).

² See Rapp, *supra* note 1, at 26 *et seq.*; Carlton & Gertner, *supra* note 1, at 39 *et seq.*; Davis, *supra* note 1, at 681 *et seq.*

³ See, e.g., Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources to Invention*, in THE RATE AND DIRECTION OF ECONOMIC ACTIVITY 609 (Richard R. Nelson ed., Princeton University Press 1962); Glenn C. Loury, *Market Structure and Innovation*, 93 Q. J. ECON. 395 (1979); Richard J. Gilbert & David M.G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514 (1982); Jennifer F. Reinganum, *The timing of innovation: Research, development, and diffusion*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 849 (Richard Schmalensee & Robert Willig eds., Elsevier 1989); FREDERIC M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE, at 513-660 (Houghton-Mifflin, 3rd edn. 1990); Jan Boone, *Competitive Pressure: The Effects on Investments in Product and Process Innovation*, 31 RAND J. ECON. 549 (2000); Jan Boone, *Intensity of Competition and the Incentive to Innovate*, 19 INT. J. IND. ORGAN. 705 (2001); Philippe Aghion et al., *Competition and Innovation: An Inverted-U Relationship*, 120 Q. J. ECON. 701 (2005).

⁴ For an excellent overview see Richard J. Gilbert, *Looking for Mr. Schumpeter: Where Are We in the Competition-Innovation Debate?*, in 6 INNOVATION POLICY AND THE ECONOMY 159, at 187-204 (Adam B. Jaffe et al. eds., MIT Press 2006).

⁵ See Wolfgang Kerber, *Competition, Innovation and Maintaining Diversity Through Competition Law*, in ECONOMIC APPROACHES TO COMPETITION LAW: FOUNDATIONS AND LIMITATIONS 173 (Josef Drexl et al. eds., Edward Elgar 2010). See also Gilbert, *supra* note 4, at 185-186.

to innovate. Since innovation is particularly subject to uncertainty, it is impossible to determine how a certain innovation has to be achieved or which R&D project will be most successful. As a consequence, for the overall innovativeness of an industry, or respectively a certain field of research, it is also beneficial that a variety of independent firms undertake R&D due to their subjective resources and expectations. Hence, in contrast to the considerations about the firms' incentives and abilities to innovate, this dimension of competition, which Joseph Farrell vividly called "the dark matter of competition", highlights the role of "diversity" for innovation and supports the idea that this characteristic of competition might also be worth protecting.⁶

It is remarkable that these considerations also played a role in a considerable number of challenges to mergers and acquisitions, investigated by the Federal Trade Commission (FTC) and the Department of Justice (DoJ).⁷ However, in contrast to its relevance in applied merger review, this dimension of competition is much less recognized in the respective antitrust literature. One explanation for this phenomenon might be the fact that mainstream economics and especially the modern industrial organization literature have fundamental difficulties to capture this dimension of competition.⁸ Apart from that it is also argued that, if "diversity" indeed has a noticeable effect on innovation, a merged entity should have an intrinsic incentive to preserve such a fruitful environment in-house.⁹ Hence, a reduction of "diversity" among different firms ("inter-firm diversity") would get balanced by an increase in the diversity within a certain firm ("intra-firm diversity") by itself. As a consequence, if one had to expect such an effect, antitrust authorities would have no reason to further consider this issue.

Therefore, by assessing the strategic management literature, this article aims to bring to light whether and how firms consider the creation/preservation of such an "intra-firm diversity". By particularly focusing on the "corporate entrepreneurship" literature we will demonstrate that the idea of a creation of independent entities in-house is indeed considered as an important determinant for the innovativeness and general performance of firms. However, we will also show that this strategy has several grave implementation problems.

⁶ See Joseph Farrell, *Complexity, diversity, and antitrust*, 51 ANTITRUST BULL. 165 (2006).

⁷ See, e.g., *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998); *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29, 1998); *Glaxo plc*, 119 F.T.C. 815 (1995); *The Upjohn, Co.*, 121 F.T.C. 44 (1996); *Ciba-Geigy Ltd.*, 123 F.T.C. 842 (1997); *Pfizer Inc. and Warner-Lambert Co.*, FTC Dkt. No. C-3957 (June 19, 2000).

⁸ See, e.g., Stanley J. Metcalfe, *Evolution and Economic Change*, in TECHNOLOGY AND ECONOMIC PROGRESS 54 (Aubrey Silbertson ed., Macmillan 1989); Richard R. Nelson, *Recent Evolutionary Theorizing about Economic Change*, 33 J. ECON. LIT. 48 (1995); Kerber, *supra* note 5.

⁹ See Raaj K. Sah & Joseph E. Stiglitz, *The Invariance of Market Innovation to the Number of Firms*, 18 RAND J. ECON. 98, at 106 (1987).

Hence, on the one hand, the extensive “corporate entrepreneurship” literature suggests that considerations about the preservation of an “inter-firm diversity” in merger review might be exaggerated because firms should indeed have a strong incentive to preserve “diversity” in-house. On the other hand, however, our analysis will also show that antitrust authorities cannot trust in the creation of such an “intra-firm diversity” after a merger, since the merged entity will most likely face grave implementation problems and conflicts of interests.

This article is structured as follows. In Part II we will provide a review of the neoclassical economics and evolutionary economics literature and highlight the differences between the considerations about the incentives and abilities to innovate on the one hand and the benefits of “diversity” for innovation on the other. Thereby we will also provide some exemplary merger cases in order to illustrate how the idea of a preservation of an “inter-firm diversity” was considered in the applied U.S. merger review during the last two decades. Subsequently, in Part III we will analyze to what extent considerations about the preservation/creation of independent entities “in-house” can be found in the strategic management literature and whether we will find evidence that this strategy is indeed regarded as a strategy that leads to an increased innovativeness and/or a superior general performance of firms. After a short interim conclusion in Part IV, we will then turn towards the question whether antitrust authorities can trust in the preservation of “diversity” as a consequence of the creation of “intra-firm diversity”, or whether they should be rather skeptical about that. Therefore, in Part V, we will firstly investigate the “corporate entrepreneurship” literature with respect to the question whether we can find critical factors for the successful implementation of such a strategy. Following the identification of these factors we will turn towards the assessment of the nature and extent of implementation problems of a “corporate entrepreneurship” strategy, as well as to possible conflicts of interests in Part VI. Part VII then concludes by drawing implications for the consideration of “diversity” aspects in merger review.

II. THE COMPETITIVE STRUCTURE AND INNOVATION

A. The incentives and abilities to innovate

A broad range of literature is dealing with the interdependencies between the competitive structure and the firms’ incentives and abilities to innovate. The controversy in the academic debate started with Joseph Schumpeter who was particularly interested in the effects of competition on innovation.¹⁰ In his early work he assumed that competition fosters innovation

¹⁰ See JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT. AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE* (Cambridge/Mass, Harvard University Press 1934).

in the sense that predominantly creative “entrepreneurs” are the main driver for innovation.¹¹ In his view competition has to be seen as a process in which mainly small, innovative start up firms come up with new ideas which become manifest in new products and production processes.¹² In his later works, however, Schumpeter conversely argued that mainly big firms in highly concentrated markets are the key to technological progress.¹³ Thereby he assumed that only these firms have the necessary ability to finance R&D projects, diversify the risks of innovative activities and appropriate its gains in a sufficient scale.

Apart from Schumpeter, there exists a rich literature dealing with the effects of competition and concentration on innovation. Arrow demonstrated for example that the fruits from an innovation might (at least to some extent) solely replace previous profits (replacement-effect) if the innovator already has some market power on the respective pre-innovation market.¹⁴ Hence, in the extreme case of a firm holding a monopoly position, the firm must fear that it will solely cannibalize its current profits by introducing an innovation to the market. As a result, a firm which possesses market power on a pre-innovation market would have fewer incentives to invest in R&D than a firm which faces fierce competition and which therefore generates merely little or even no pre-innovation profits.

Another very popular and likewise important argument why a rather less concentrated competitive structure drives innovation is the assumption that a firm, which does not fear rivalry from other competitors, would have no incentives at all to develop new products or production processes, because there is no need to improve or defend its market position¹⁵ Yet another aspect why a more competitive structure might be the beneficial environment for innovation is based on the idea of patent races.¹⁶ An important characteristic of these models is the assumption that there exists perfect patent protection. Under such a setting, the innovator gains an exclusive right to market the invention. Thus, every firm taking part in this race has a strong incentive to be the first to invent. As a consequence, consumers may benefit from such an environment in the sense that new products or technologies are discovered earlier as compared to a situation in which there is solely little or no competition.

However, like in the later work of Schumpeter, other scholars also argued that a concentrated competitive structure can equally foster innovation. By assuming product innovations and imperfect patent protection, Frederic Scherer and David Ross showed that

¹¹ *Id.* at 74 *et seq.*

¹² *Id.*

¹³ See JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY, at 131-134 (Harper 1942).

¹⁴ See Arrow, *supra* note 3.

¹⁵ See John R. Hicks, *Annual Survey of Economic Theory: The Theory of Monopoly*, 3 *ECONOMETRICA* 1 (1935). See also Michael Katz & Howard Shelanski, *supra* note 1, at 9.

¹⁶ See Loury, *supra* note 3; Reinganum, *supra* note 3.

increased competition can indeed foster innovation (stimulus factor) - but solely until a certain limit.¹⁷ Too much competition might also hinder innovation in the sense that under very intense competition it is no longer possible to undertake profitable R&D projects because the innovation costs can no longer be recouped (market room factor). The authors therefore described the interrelation between the competitive structure and innovation in the pattern of an inverted-U. This finding was confirmed in a recent article of Aghion et al.¹⁸ By differentiating between sectors with “neck-and-neck competitors” and those with “leading-” and “laggard competitors”, they showed that strong competition as well as market power can foster innovation, depending on whether the incentives to strive for “Schumpeterian rents” or the incentives to realize a so-called “escape-competition effect” outweighs the other. Other authors even demonstrated that also a monopoly might have strong incentives to innovate in order to defend its current monopoly position by patenting new technologies before potential competitors.¹⁹ As a result, to date, no general causal interrelationship between the competitive structure and the incentives and abilities to innovate has been found. However, this finding should be interpreted with caution. The majority of the contributions presented above investigated the interrelation between market structure (instead of the competitive structure) and innovation. Since the competitors with respect to innovation do not necessarily compete with one another on actual product markets, a merger which changes the competitive structure with respect to innovation competition does not inevitably affect product market concentration.²⁰ If, however, a merger does not change product market structure, many arguments about the firms’ incentives and abilities to innovate, stemming from considerations about pre-innovation profits and the appropriability of innovation gains, do no longer play a role in such an environment. As a consequence, many findings of the literature cited above cannot be transferred one-to-one to the interrelation between the competitive structure of innovation competition and innovation.

B. Competitive Structure, Diversity, Parallel Research and Innovation from an Evolutionary Economics Perspective

While the discussion introduced in the last chapter mainly dealt with the question whether a highly competitive or rather a more concentrated competitive structure generates higher

¹⁷ See Frederic M. Scherer & David Ross, *supra* note 3, at 630-644.

¹⁸ See Philippe Aghion et al., *Competition and Innovation: An Inverted-U Relationship*, 120 Q. J. ECON. 701 (2005).

¹⁹ See Richard J. Gilbert & David M.G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514 (1982).

²⁰ See Richard J. Gilbert & Steven C. Sunshine, *supra* note 1; Drexler, *supra* note 1.

incentives and/or augmented abilities to innovate, we will now focus on the role of “diversity” for innovation. It is remarkable that, in comparison to the questions related to a firm’s incentives and abilities to innovate, much less research has been carried out with respect to this dimension of competition for innovation. However, in 2006 Joseph Farrell introduced a paper which demonstrates the relevance of “diversity” from a competition policy perspective in a very vivid way.²¹ In his article about “Complexity, diversity, and antitrust” he described his situation as a person who has got a peanut allergy in the context of the research efforts of the big pharmaceutical firms for a proper treatment for this allergy. The story was told as follows: A small biotech company called Tanox pursued a promising peanut allergy treatment called TNX-901. But, in 2003 Tanox’s corporation partners (Novartis and Genentech) insisted on the withdrawal of this research trial because, as they argued, the most promising drug was already found. However this promising treatment - Xolair - was already in the market for different indications. Whereon Farrell wondered:

“[...] why not pursue both potentially life-saving treatments? Apparently Tanox thought it worth pursuing TNX-901 given the status of Xolair, which would be the normal market test if no ‘contract got in the way’ [...]”²²

So he asked himself: “Isn’t diversity of approach one of the benefits of competition?”²³ And: “How, if at all, should antitrust seek to protect such diversity against (let’s assume) technical experts’ best judgements about ‘the most promising project’?”²⁴

Even though very anecdotal, Farrell’s considerations out of a private demand lead our attention to the question about the role of “diversity” for innovation and consumer welfare. Compared to the debate related to the firms’ incentives and abilities to innovate, which is dominated by the industrial organization literature, the considerations about the important role of “diversity” are mainly rooted in evolutionary economics. The theoretical basis for considerations about these aspects in merger review can be seen in the Hayekian concept of “competition as a discovery procedure”.²⁵ Therein Hayek assumed that knowledge is always tacit, fragmental and dispersed.²⁶ Beside the storable, scientific knowledge, he emphasized the meaning of knowledge as a “particular circumstance[s] of time and place” which “never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and

²¹ See Farrell, *supra* note 6.

²² *Id.* at 166.

²³ *Id.* at 166.

²⁴ *Id.* at 166.

²⁵ See Friedrich A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519 (1945); Friedrich A. Hayek, *Competition as a Discovery Procedure*, in *NEW STUDIES IN PHILOSOPHY, POLITICS, ECONOMICS AND THE HISTORY OF IDEAS* 179 (Friedrich A. Hayek ed., University of Chicago Press 1978).

²⁶ See Friedrich A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, at 519 (1945).

frequently contradictory knowledge which all the separate individuals possess”.²⁷ Thus, for Hayek, knowledge has an inevitably subjective character. This holds especially true for individual expectations, abilities, routines or a firm’s business culture which is very important for day-to-day business, but hard to teach and learn. As a consequence, all individuals and all firms have a different knowledge base and should therefore be regarded as heterogeneous entities. Besides that, the idea of “tacit knowledge” in combination with (true) uncertainty²⁸ also implies that the firms do not perfectly know ex ante which product is suited best to fulfil consumers’ needs, match with their preferences or how a certain innovation should be achieved best. Instead, each firm necessarily has to form its own expectations. This implies, especially in regard to innovation, that actions with respect to the future always rely on assumptions and expectations which can be either right or wrong.

This point of view is again in line with Farrell who wondered whether one important characteristic of competition might already be the persistence with approaches that other market participants think unpromising.²⁹ Farrell suggested that otherwise, if alternative approaches were clearly smart, even a monopoly could profitably pursue them.³⁰ This dimension of competition, the benefits of having a variety of different entities in the competition process, is what Farrell called very pictorially “the dark matter of competition”.³¹

The described knowledge problem is also a key component of evolutionary economics more generally.³² In their seminal works, Richard R. Nelson and Sidney G Winter, for example, consider firms as diverse sets of “routines”.³³ In this connection, competition is considered as a process of variation and selection in which heterogeneous firms continuously offer solutions, in the form of new or at least modified products, for the problems and needs of consumers.³⁴ Thus, competition has an inherent experimental character of trial and error in which only the firms which have the right beliefs and expectations, will prevail while the others will disappear.³⁵ As a result, a reduction of the number of competitors is understood as a natural phenomenon in the competition process. However, whenever mergers and acquisitions further reduce the number of independent competitors, the thereby induced

²⁷ *Id.*

²⁸ See FRANK H. KNIGHT, RISK, UNCERTAINTY, AND PROFIT, (Houghton Mifflin 1921).

²⁹ See Farrell, *supra* note 6, at 168.

³⁰ *Id.* at 168.

³¹ *Id.* at 168.

³² See Nelson *supra* note 8, Metcalfe *supra* note 8, Kerber *supra* note 5.

³³ See RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE, at 96 *et seq.* (Harvard University Press 1982).

³⁴ *Id.*

³⁵ *Id.*

reduction of “diversity” can be detrimental for innovation, at least under remarkable entry barriers for the participation in a certain process of innovation competition.³⁶

Beside Hayek and the evolutionary economics literature, the view of heterogeneity between market participants is also shared in the management literature, particularly in the “resource-based view of the firm”.³⁷ This field of literature highlights the importance of a firm’s particular resources like especially trained staff, experience, patents or a firm’s business culture.³⁸ Thus, in contrast to mainstream economics, where firms differ almost exclusively by the nature of their cost functions, firms are considered as entities which differ also with respect to their particular capabilities – capabilities which cannot be acquired and adopted easily in an adequate period of time. In regard to innovation, this assumption implies that not only the incentives and the abilities to innovate matter, but also the variety of heterogeneous firms of which each might carry unique capabilities and ideas.

Apart from economics and management it is also important to refer to the biodiversity literature where researchers analyze for instance the consequences of a decrease in the richness of species as a result of monoculture or dying breeds.³⁹ In this respect it is argued that “diversity” matters in order to preserve nature’s capability to adapt to new conditions of a changing environment. This proposition is based on research findings which demonstrated that biodiversity indeed increases the probability that some species will adapt to an exogenous shock and therefore allows for a faster adjustment of the ecosystem to environmental changes.⁴⁰ Furthermore, Tilman et al. have shown that, due to a so-called “probability effect”, the productivity of plants is positively correlated with the degree of biodiversity.⁴¹ These characteristics of biodiversity can also be understood as an “option-“ or “insurance value”

³⁶ The idea of entry barriers for the participation in the process of innovation competition is closely linked to the proposed assessment of specialized assets in the Innovation Market Analysis. See Richard J. Gilbert & Steven C. Sunshine, *supra* note 1, at 588 *et seq.*

³⁷ See EDITH PENROSE, *THE THEORY OF THE GROWTH OF THE FIRM* (John Wiley and Sons 1959); Jay B. Barney, *Firm Resources and Sustained Competitive Advantage*, 17 J. MANAGE. 99 (1991); CYNTHIA A. MONTGOMERY, *RESOURCE-BASED AND EVOLUTIONARY THEORIES OF THE FIRM: TOWARDS A SYNTHESIS* (Kluwer Academic Publishers 1995).

³⁸ See, e.g., Scott L. Newbert, *Empirical Research on the Resource-Based View of the Firm: An Assessment and Suggestions for Future Research*, 28 STRATEG. MANAGE. J. 121 (2007).

³⁹ See GISELA LINGE, *COMPETITION POLICY, INNOVATION, AND DIVERSITY*, at 122 *et seq.* (Tectum Verlag 2008); For a rich overview on biodiversity in particular see e.g. Nina-Marie E. Lister, *A systems approach to biodiversity conservations planning*, 49 ENVIRONMENTAL MENTORING AND ASSESSMENT 123 (1998).

⁴⁰ See, e.g., Randall Hughes & John J. Stachowitz, *Genetic diversity enhances the resistance of a seagrass ecosystem to disturbance*, 101 P. NATL. ACAD. SCI. USA. 8998 (2004); Boris Worm & J. E. Duffy, *Biodiversity, productivity and stability in real food webs*, 18 TRENDS ECOL. EVOL. 162 (2003); David Tilman & J. A. Downing, *Biodiversity and stability in grasslands*, 367 NATURE 363 (1994).

⁴¹ See, David Tilman et al., *Diversity, productivity and temporal stability in the economics of humans and nature*, 49 J. ENVIRON. ECON. MANAG. 405, at 412 *et seq.* (2005).

which implies that “diversity” might play an essential role, even though the benefits are not obvious to us at the moment.⁴²

It is interesting that some of the particular arguments put forward in the biodiversity literature can be applied again to the economic context. The idea of an “option value”, for instance, is also well known to economists.⁴³ In the competition context this value is created due to the fact that, under uncertainty, it is a priori unknown which firm or technology is suited best to solve future problems or how a certain technology can be achieved.⁴⁴ From this point of view, it might be of relevance that a variety of independent firms exists. In analogy to the biodiversity literature, “diversity” should, on the one hand, augment the likelihood that there is at least one firm which has the necessary capabilities to adapt to a possible “environmental change” and thereby solve a particular problem in the future. On the other hand, the “diversity” of approaches, in the sense of different actual employed R&D programs, can also lead to an increased probability that at least one of these current programs will be successful.

In summary, there are actually two different reasons why “diversity” can be beneficial for innovation. First, “diversity” can be of value in the sense that there exists a variety of heterogeneous and independent sources for future innovation. As a consequence, consumers would benefit from this variety in the sense that there is not just one but a couple of firms which have the capability to produce future innovations in a certain field of research. This should, in analogy to the biodiversity literature, augment the probability that there is at least one firm that offers an adequate solution for a certain problem in the future. It is remarkable that especially the U.S. antitrust agencies have put forward this line of argumentation in several challenges to mergers and acquisitions.⁴⁵ In its Complaint concerning the proposed acquisition of Northrop Grumman by Lockheed Martin in 1998 the DoJ argued for instance that:

⁴² It is remarkable that also the United Nations declared the year 2010 to be the international year of biodiversity. See Julia Marton-Lefèvre, *Biodiversity Is Our Life*, 327 SCIENCE 1179, available at <http://www.sciencemag.org/content/327/5970/1179.full.pdf> (Feb. 5, 2013).

⁴³ See, e.g., Richard L. Schmalensee, *Option demand and consumer's surplus: Valuing price changes under uncertainty*, 62 AM. ECON. REV. 813 (1972); Kenneth J. Arrow & Anthony C. Fisher, *Environmental Preservation, Uncertainty, and Irreversibility*, 88 Q. J. ECON. 312 (1974); David M. Kreps, *A representative theorem for 'preferences for flexibility'*, 47 ECONOMETRICA 565 (1979).

⁴⁴ See, Stefan H. Thomke, EXPERIMENTATION MATTERS: UNLOCKING THE POTENTIAL OF NEW TECHNOLOGIES FOR INNOVATION, at 25 *et seq.* (Harvard Business School Press 2003).

⁴⁵ See *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998); *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29, 1998); *United States v. General Dynamics Corp.*, Civ. No. 1:01CV02200 (D.D.C. complaint filed Oct. 23, 2001).

“[...] Northrop, Lockheed, and Boeing do all pursue new ideas and designs for future high performance fixed-wing military aircraft to meet specific combat needs, and these firms are the only companies that have the capabilities to compete for combined electronics system integration and military airframe upgrades. The loss of Northrop as an independent entity will reduce the number of companies to which the Department of Defence can turn to design, develop, and produce high performance fixed-wing military aircraft from three to two”.⁴⁶

Hence, the DoJ obviously highlighted the relevance of the preservation of at least three independent entities as potential innovators and thereby aimed to protect “diversity” as an important feature of competition for innovation in order to meet future combat needs.

In addition to the relevance of “diversity” as a source for future innovations in a particular field of research, the second reason why “diversity” might play a crucial role for innovation is linked to research and development efforts which are already underway. In this respect “diversity” refers to research tracks which are carried out in parallel by distinct and independent entities, entities which have different beliefs and expectations about the most promising way to achieve a certain innovation. This idea of “parallel experimentation” or “parallel research” corresponds pretty much to Joseph Farrell’s Tanox-story in which he also questioned whether the abortion of the Xolair program might have been a bad decision from a consumers’ point of view. Like in the case in which “diversity” is understood as a source for future innovations, the U.S. antitrust agencies also challenged a remarkable number of mergers and acquisitions in which considerations about the preservation of existing parallel research paths played an important role.⁴⁷ Thereby, the agencies argued in the majority of these merger cases that the transaction could lead to a “reduction or redirection” of research and development tracks. Hence, both the fear of a reduction as well as the suspected alignment of formerly independent research tracks can be associated with the protection of a “diversity” of research paths. Thus, in contrast to many industrial organization models in which “parallel research” is often seen as a wasteful duplication of R&D expenditures⁴⁸, “parallel research”, carried out by independent entities, has to be seen more positively from this perspective. However, in the mainstream economics literature the relationship between the competitive structure, the number of independent firms which are simultaneously undertaking R&D and the consequential benefits for innovation plays only a minor role. A

⁴⁶ See *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998), at 27.

⁴⁷ See, e.g., *American Home Products Corp.*, 119 F.T.C. 217 (1995); *Pfizer Inc. and Warner-Lambert Co.*, FTC Dkt. No. C-3957 (June 19, 2000); *Baxter Int’l, Inc.*, 123 F.T.C. 904 (1997); *Ciba-Geigy Ltd.*, 123 F.T.C. 842 (1997); *The Upjohn, Co.*, 121 F.T.C. 44 (1996); *Glaxo plc*, 119 F.T.C. 815 (1995); *Glaxo Wellcome plc*, 131 F.T.C. 56 (2001).

⁴⁸ See, e.g., *Loury*, *supra* note 3; *Reinganum*, *supra* note 3.

good example which illustrates how heterogeneity and “parallel research” is considered in mainstream economics is provided by the seminal article of Raaj K. Sah and Joseph E. Stiglitz.⁴⁹ Therein the authors demonstrated that, independently of the number of firms, there will always be an efficient market equilibrium (even though smaller than the socially optimal level) of research projects from an economy wide perspective.⁵⁰ Given a certain value of an innovation, each firm will pursue a certain number of R&D projects to optimize its probability of success in dependence of its research costs. If the number of firms decreases, the number of research projects of the remaining firms’ increases and the total number of R&D projects in the market will still maximize the economy wide probability for success. As a consequence, the number of firms pursuing research projects in parallel has no impact on the innovative performance of an industry. However, this result only holds under the strong assumptions that the firms are homogeneous (have the same capabilities to undertake R&D). The authors acknowledged that:

”[...] the probability of success of a particular project (conditional, say, on the failure of all other projects) is a function of the expenditure on that project and the expenditures on other projects, but not a function of the firms in which those other projects are undertaken.”⁵¹

Thus, only if the firms are considered as not being different with respect to how they do business, it is irrelevant (the probability of a success innovation is unaffected) if for example two R&D projects are undertaken by two distinct firms or simply by one big firm. This, however, is an assumption which one has to doubt against an evolutionary economics background.

Nevertheless, there still remains a fundamental question. If the probability for a successful innovation also hinges on the variety of different, independent entities with unique capabilities, ideas, visions and business cultures - why should the merged entity abandon this variety? Would the merged firm not have an intrinsic incentive to maintain this “diversity” in-house in order to augment its probability for a successful innovation? Raaj K. Sah and Joseph E. Stiglitz already argued that:

“[...] if different projects within a firm are sufficiently isolated from one another (for instance, because of the need to monitor the performance of different groups of researchers), then the firm affiliation may be less relevant.”⁵²

⁴⁹ See Raaj K. Sah & Joseph E. Stiglitz, *supra* note 9, at 98 *et seq.*

⁵⁰ *Id.*

⁵¹ *Id.*, at 106.

⁵² *Id.*

The same question can be posed with respect to the first characteristic of “diversity”. If “diversity” indeed augments the probability that at least one firm has the capability to solve an unspecified problem in the future and will therefore successfully adapt to an environmental change, firms should again have an intrinsic incentive to create/preserve such an environment in-house, in order to ensure their survival in the long-run.⁵³

Hence, the crucial questions which have to be clarified in this respect are (1) whether merged entities do indeed consider the creation/preservation of “diversity” in-house. If our considerations about the benefits of “diversity” and “parallel research” are correct, one would expect that we can also find respective evidence for this assumption in the management literature. However, in the event that we find evidence for the assumption that firms do indeed consider the preservation of “diversity”, it is still not guaranteed that they will really undertake such an attempt at the end of the day. Firms might face several conflicts of interests, as well as several problems in line with the creation/preservation of “diversity” in-house. Hence, (2) we want to find out whether competition authorities can rely on an increase in the “intra-firm-diversity” which would compensate for a reduction of “inter-firm-diversity”, or whether they should rather expect a loss of “diversity” and some sort of alignment of formerly different approaches? Thus, to begin, the next chapter will analyze the strategic management literature in order to bring to light whether and how the role of “diversity” is considered in connection with the innovative performance of firms.

III. INNOVATION FROM A MANAGEMENT PERSPECTIVE

From a management perspective it is widely accepted that the generation of innovation in large firms requires numerous prerequisites such as adaptability, flexibility, corporate risk-taking behavior, speed or aggressiveness.⁵⁴ To facilitate such conditions, the management literature suggests the creation of “intra-firm-diversity” by establishing decentralized entities with a high degree of freedom of choice in order to combine the entrepreneurial spirit of small, independent companies with the resources of large corporations.⁵⁵ This “intra-firm-diversity” can have numerous manifestations such as subsidiaries, joint-ventures, strategic

⁵³ For a further discussion see also the literature on dynamic capabilities. See, e.g., David J. Teece et al., *Dynamic Capabilities and Strategic Management*, 18 STRAT. MGMT. J. 509 (1997); Kathleen M. Eisenhardt & Jeffrey A. Martin, *Dynamic Capabilities: What are they?* 21 STRAT. MGMT. J. 1105 (2000).

⁵⁴ See Daniel F. Jennings & James R. Lumpkin, *Functioning Modeling Corporate Entrepreneurship: An Empirical Integrative Analysis*, 15 J. MANAGE. 485 (1989).

⁵⁵ See Edwin L. Hobson & Richard M. Morrison, *How Do Corporate Start-Up Venture Fare?*, in FRONTIERS OF ENTREPREUNERSHIP RESEARCH 390 (John A. Hornaday et al. eds., Babson Centre For Entrepreneurial Studies, Wellesley/Mass 1983).

alliances or business units or most recently the open-innovation approaches.⁵⁶ The establishment of heterogeneous units and the consequential creation of “intra-firm-diversity” is expected to be superior and serve as a competitive advantage through the identification and exploitation of entrepreneurial opportunities and thus the generation of innovation.⁵⁷ This line of research is generally summed up under one ideational umbrella: Corporate Entrepreneurship (CE).⁵⁸

CE was first mentioned by scholars in the 1960s, then again gaining popularity in the early 1990s, it is till today a hot topic in the management literature. Despite the tremendous amount of literature concerning CE, scholars have not reached a consensus on the concept, not even in labeling it.⁵⁹ The most prominent terms include “intrapreneurship”⁶⁰, “internal corporate entrepreneurship”⁶¹, “corporate venturing”⁶², “new ventures”,⁶³ “entrepreneurial management”⁶⁴, or “strategic entrepreneurship”⁶⁵. In the remainder of the article we will only

⁵⁶ See Bing-Sheng Teng, *Corporate Entrepreneurship Activities Through Strategic Alliances: A Resource-Based Approach Toward Competitive Advantage*, 44 J. MANAGE. STUD. 119 (2007); Shaker A. Zahra, *Governance, Ownership, And Corporate Entrepreneurship: The Moderating Impact Of Industry Technological Opportunities*, 39 ACAD. MANAGE. J. 1713 (1996); MICHAEL H. MORRIS ET AL., *CORPORATE ENTREPRENEURSHIP & INNOVATION* (2nd ed., South-Western/Mason 2008).

⁵⁷ See, Jeffrey G. Covin & Morgan P. Miles, *Corporate Entrepreneurship And The Pursuit Of Competitive Advantage*, 23 ENTREP. THEORY PRACT. 47 (1999); R. Duane Ireland et al., *Conceptualizing Corporate Entrepreneurship Strategy*, 33 ENTREP. THEORY PRACT. 19 (2009); James C. Hayton, *Strategic Human Capital Management In Smes: An Empirical Study Of Entrepreneurial Performance*, 42 HUM. RESOURCE MANAGE. 375 (2003); Todd J. Hostager et al., *Seeing Environmental Opportunities: Effects Of Intrapreneurial Ability, Efficacy, Motivation And Desirability*, 11 J. ORGAN. CHANGE MANAG. 11 (1998).

⁵⁸ See Robert A. Burgelman, *Corporate Entrepreneurship And Strategic Management: Insights From A Process Study*, 29 MANAGE. SCI. 1349 (1983).

⁵⁹ See Lan Li et al., *An Empirical Study Of Corporate Entrepreneurship In Hospitality Companies*, 10 INT. J. HOSP. TOURISM ADM. 213 (2009); Karina S. Christensen, *A Classification Of The Corporate Entrepreneurship Umbrella: Labels And Perspectives*, 1 IJMED 301 (2004); Gregory G. Dess et al., *Emerging Issues In Corporate Entrepreneurship*, 29 J. MANAGE. 351 (2003).

⁶⁰ See, e.g., GIFFORD PINCHOT, *INTRAPRENEURING: WHY YOU DON'T HAVE TO LEAVE THE CORPORATION TO BECOME AN ENTREPRENEUR* (Harper And Row, New York 1985); Camille Carrier, *Intrapreneurship In Large Firms And Smes: A Comparative Study*, 12 INT. SMALL. BUS. J. 54 (1994); Camille Carrier, *Intrapreneurship In Small Businesses: An Exploratory Study*, 21 ENTREP. THEORY PRACT. 5 (1996); Bostjan Antoncic & Robert D. Hisrich, *Intrapreneurship: Construct Refinement And Cross-Cultural Validation*, 16 J. BUS. VENTURING 495 (2001); Lin Chinho et al., *Fuzzy Fitness Model Of Intrapreneurship Activities Or Taiwanese High-Tech Firms*, 1 IJMED 45 (2003).

⁶¹ See, e.g., Hans Schollhammer, *The Efficacy Of Internal Corporate Entrepreneurship Strategies*, in *FRONTIERS OF ENTREPREUNERSHIP RESEARCH* (Karl H. Vesper eds., Wellesley/Mass, Babson College 1981); Gareth R. Jones & John E. Butler, *Managing Internal Corporate Entrepreneurship: An Agency Theory Perspective*, 18 J. MANAGE. 733 (1992); G. T. Lumpkin & Gregory G. Dess, *Clarifying The Entrepreneurial Orientation Construct And Linking It To Performance*, 21 ACAD. MANAGE. REV. 135 (1996).

⁶² See R. J. Ellis & N. T. Taylor, *Specifying Entrepreneurship*, in *FRONTIERS OF ENTREPREUNERSHIP RESEARCH* 527 (N. C. Churchill et al. eds., Babson College, Wellesley/Mass 1987).

⁶³ See Edward B. Roberts, *New Ventures for Corporate Growth*, 58 HARVARD BUS. REV. 134 (1980).

⁶⁴ See Howard H. Stevenson & J. Carlos Jarillo, *A Paradigm of Entrepreneurship: Entrepreneurial Management*, 11 STRATEGIC MANAGE. J. 17 (1990).

⁶⁵ See, e.g., Michael A. Hitt et al., *Guest Editors' Introduction to The Special Issue Strategic Entrepreneurship: Entrepreneurial Strategies For Wealth Creation*, 22 STRATEGIC MANAGE. J. 479 (2001); R. Duane

use the term CE, since it is the most commonly used term. Since the field of CE itself is so highly heterogeneous, we provide a small overview of the most common definitions, in order to clarify the most relevant aspects:

Table 1: Definitions of Corporate Entrepreneurship

Author:	Definition:
Burgelman	<i>„Corporate Entrepreneurship in this paper refers to the process whereby firms engage in diversification through internal development. Such diversification requires new resource combinations to extend the firm’s activities in areas unrelated, or marginally related, to its current domain of competence and corresponding opportunity set.”⁶⁶</i>
Chung & Gibbons	<i>“Corporate entrepreneurship is an organizational process for transforming individual ideas into collective actions through the management of uncertainties.”⁶⁷</i>
Guth & Ginsberg	<i>„Corporate Entrepreneurship encompasses two types of phenomena and the processes surrounding them: (1) the birth of new businesses within existing organizations, i.e. internal innovation or venturing; and (2) the transformation of organizations through renewal of key ideas on which they are built, i.e strategic renewal.”⁶⁸</i>
Jennings & Lumpkin	<i>“Corporate Entrepreneurship is defined as the extent to which new products and / or new markets are developed. An organization is entrepreneurial if it develops a higher than average number of new products and / or new markets.”⁶⁹</i>
Spann et al.	<i>“Corporate entrepreneurship is the establishment of a separate corporate organization (often in the form of a profit center, strategic business unit, division, or subsidiary) to introduce a new product, serve or create a new market, or utilize a new technology.”⁷⁰</i>
Vesper	<i>„Corporate Entrepreneurship involves employee initiative form below in the organization to undertake something new. An innovation, which is created by subordinates without being asked, expected, or perhaps even given permission by higher management to do so.”⁷¹</i>
Zahra	<i>“Corporate Entrepreneurship includes radical product innovation, risk taking, and proactiveness (...). It also includes business venturing and “intrapreneuring (...) and organizational renewal.”⁷²</i>

Source: Authors

Ireland et al., *Integrating Entrepreneurship And Strategic Management Actions To Create Firm Wealth*, 15 ACAD. MANAGE. EXEC. 49 (2001).

⁶⁶ Burgelman, *supra* note 58, at 1349.

⁶⁷ Lai Hong Chung & Patrick T. Gibbons, *Corporate Entrepreneurship: The Roles Of Ideology And Social Capital*, 22 GROUP ORGAN. MANAGE. 10, at 14 (1997).

⁶⁸ William D. Guth & Ari Ginsberg, *Guest Editors’ Introduction: Corporate Entrepreneurship*, 11 STRATEGIC MANAGE. J. 5, at 5 (1990).

⁶⁹ Jennings & Lumpkin, *supra* note 54, at 489.

⁷⁰ M.S. Spann et al., *Entrepreneurship: Definitions, dimensions and dilemmas*, PROCEEDINGS OF THE US ASSOCIATION FOR SMALL BUSINESS AND ENTREPRENEURSHIP 147, at 149 (1988).

⁷¹ Karl H. Vesper, *Three faces of corporate entrepreneurship: A pilot study*, in FRONTIERS OF ENTREPRENEURSHIP RESEARCH 294-326, at 295 (John A. Hornaday et al. eds., Wellesley, MA. Babson College 1984).

⁷² Zahra, *supra* note 56, at 1713.

As seen above these definitions are ranging from diversification processes, transforming ideas, risk taking, venturing new business units, strategic renewal, new markets and generating new products or technologies. Most definitions, including those not displayed in table 1, agree on the fact that CE is a key capability for firms to generate innovations.⁷³ Or as Covin et al. have put it:

“[...] innovation, broadly defined, in the single common theme underlying all forms of corporate entrepreneurship.”⁷⁴

There are various reasons why firms engage in the processes associated with CE. On the one hand, when established companies seek new business opportunities they have to overcome various internal boundaries such as administrative barriers, risk aversion or organizational slack. Moreover, organizations are facing increased demands on individual products, fast-changing markets and increasing information flows. This requires a well adapting, flexible or even an entrepreneurial company. On the other hand a clear structured, highly hierarchical and effective organization also encompasses advantages and is particularly well suited for other environments, like stable markets focusing on cost reduction. Since most organizations do not operate solely in one market or segment, they have to overcome this paradox by focusing on CE to create Innovations.

Empirical research has most notably linked CE to advanced financial performance⁷⁵ and firm growth⁷⁶. Therefore it is no surprise that corporations engage in CE processes, with numerous examples in the literature. It has been tried to establish CE in a variety of industries, e.g. the chemical industry⁷⁷ or even non-profit organizations⁷⁸. Moreover CE activity has been reported in for instance in Canadian⁷⁹, German⁸⁰, New Zealand⁸¹ or Dutch

⁷³ See Elspeth McFadzean et al., *Corporate Entrepreneurship And Innovation Part 1: The Missing Link*, 8 EJIM 350 (2005).

⁷⁴ Jeffrey G. Covin & Morgan P. Miles, *Corporate Entrepreneurship And The Pursuit Of Competitive Advantage*, 23 ENTREP. THEORY PRACT. 47 (1999).

⁷⁵ See, e.g., Shaker A. Zahra & Jeffrey G. Covin, *Contextual Influences on The Corporate Entrepreneurship Performance Relationship: A Longitudinal Analysis*, 10 J. BUS. VENTURING 43 (1995); Nihat Kaya, *The Impact Of Human Resource Management Practices And Corporate Entrepreneurship On Firm Performance: Evidence From Turkish Firms*, 17 INT. J. OF HUM. RESOUR. MAN. 2074 (2006).

⁷⁶ See, e.g., Bostjan Antoncic & Robert D. Hisrich, *Intrepreneurship: Construct Refinement And Cross-Cultural Validation*, 16 J. BUS. VENTURING 495 (2001); Franz W. Kellermanns & Kimberly A. Eddleston, *Corporate Entrepreneurship In Family Firms: A Family Perspective*, 30 ENTREP. THEORY PRACT. 809 (2006).

⁷⁷ See, Gautam Ahuja & Curba M. Lampert, *Entrepreneurship In The Large Corporation: A Longitudinal Study Of How Established Firms Create Breakthrough Inventions*, 22 STRATEGIC MANAGE. J. 521 (2001).

⁷⁸ See Daniel T. Holt et al., *Corporate Entrepreneurship: An Empirical Look At Individual Characteristics, Context, And Process*, 13 J. LEADER ORGAN. STUD. 40 (2007); Claudine Kearney et al., *Change Management Through Entrepreneurship In Public Sector Enterprises*, 15 JDE 415 (2010).

⁷⁹ See Erik G. Rule & Donald W. Irwin, *Fostering Intrapreneurship: The New Competitive Edge*, 9 IJBS 44 (1988).

corporations⁸². It is not even bound to industrialized countries. We found examples of CE activity in China⁸³, Turkey⁸⁴ or Argentina⁸⁵. On a corporation level, our literature review has brought to light several case studies on CE in corporations such as Philips⁸⁶, Intel and General Electric⁸⁷, FedEx⁸⁸, Sony⁸⁹, Google⁹⁰, Accordia⁹¹, AT&T⁹² or 3M⁹³ just to name a few.

But, empirical studies show that the implementation of CE is apparently underlying certain variations. In the 1960s and early 1970s, 25% of the Fortune 500 had a corporate venturing program. These were largely disbanded in the 1970s. By the early 1980s, the corporate venturing was put back on the spot of corporations. But again, these initiatives were discontinued after the market downturn in 1987. In the beginning of the 1990s the corporate venturing efforts gaining momentum again, corporations have re-introduced CE activities.⁹⁴ After the dot-com bubble burst, the initiatives were reconsidered and restructured again, since many firms were unsatisfied with outcomes of the CE practices.⁹⁵

The remarks and examples above are supposed to underline the relevance of CE in academia and practice. Besides this, our findings indicate that several firms already tried to implement CE and that some of them even had a remarkable success in terms of financial performance and the generation of innovation.

⁸⁰ See Ralf Schmelter et al., *Boosting Corporate Entrepreneurship Through Hrm Practices: Evidence From German Smes*, 49 HUM. RESOURCE MANAGE. 715 (2010).

⁸¹ See Jarrod M. Haar & Brook J. White, *Corporate Entrepreneurship And Information Technology Towards Employee Retention: A Study Of New Zealand Firms*, 23 HUMAN RESOURCE MANAGEMENT JOURNAL 109 (2013).

⁸² See Bruce H. Kemelgor, *A Comparative Analysis Of Corporate Entrepreneurial Orientation Between Selected Firms In The Netherlands And The USA*, 14 ENTREP. REGION DEV. 67 (2002).

⁸³ See Zhe Zhang & Ming Jia, *Using Social Exchange Theory To Predict The Effects Of High-Performance Human Resource Practices On Corporate Entrepreneurship: Evidence From China*, 49 HUM. RESOURCE MANAGE. 743 (2010).

⁸⁴ See Kaya, *supra* note 75, at 2074 *et seq.*

⁸⁵ See SERGIO POSTIGO, *CORPORATE ENTREPRENEURSHIP: AN EXPLORATORY RESEARCH IN ARGENTINA* (Universidad de San Andrés 2002).

⁸⁶ See Simon Ford et al., *Evolving Corporate Entrepreneurship Strategy: Technology Incubation At Philips*, 40 R&D MANAGE. 81 (2010).

⁸⁷ See John Zimmerman, *Corporate Entrepreneurship At GE And Intel*, 6 JBCS 77 (2010).

⁸⁸ See Broto R. Bhardwaj & Kirankumar S. Momaya, *Role Of Organizational Flexibility For Corporate Entrepreneurship: Case Study Of Fedex Corporation*, 7 GLOB. J. FLEX. SYSTEMS MANAGE. 37 (2006).

⁸⁹ See Chung & Gibbons, *supra* note 67.

⁹⁰ See Todd A. Finkle, *Corporate Entrepreneurship And Innovation In Silicon Valley: The Case Of Google, Inc.*, 36 ENTREP. THEORY PRACT. 863 (2012).

⁹¹ See Donald F. Kuratko et al., *Improving Firm Performance Through Entrepreneurial Actions: Acordia's Corporate Entrepreneurship Strategy*, 15 ACAD. MANAGE. EXEC. 60 (2001).

⁹² See Michael H. Morris & J. Don Trotter, *Institutionalizing Entrepreneurship In A Large Company: A Case Study At AT&T*, 19 IND. MANKET MANAG. 131 (1990).

⁹³ See Hostager et al., *supra* note 57, at 12 *et seq.*

⁹⁴ Henry Chesbrough, *Designing Corporate Ventures In The Shadow Of Private Venture Capital*, 42/3 CALIF. MANAGE. REV. 31 (2000).

⁹⁵ See Morris et al., *supra* note 56.

IV. INTERIM CONCLUSION

The insights we have gained so far are a bit inconclusive from a competition policy perspective. First of all, it is remarkable that many scholars, who can be associated with the discipline of strategic management, are obviously highly interested in the impact of a decentralized and rather flexible organizational structure, which is supposed to create an entrepreneurial environment, on innovation and the general financial performance of firms. Thus, on the one hand, the extensive corporate entrepreneurship literature indicates that decentralized and independently operating business units, which possess a wide scope of decision-making and action as well as responsibility for their own budget, indeed foster innovation. Hence, it can be derived that “diversity”, irrespective of the fact whether it can be found in-house or in the competition process among firms, apparently matters. On the other hand, the findings suggest that “diversity” concerns in merger review might be exaggerated. Since a successful implementation of corporate entrepreneurship can be expected to foster the innovativeness of firms and can furthermore lead to a significant increase of the financial performance, even merged entities should have an intrinsic motivation to engage in CE activities and thereby create/preserve “diversity” in-house. Hence, if CE can be implemented trouble-free, a reduction of “inter-firm-diversity” might simply get balanced by an increase in “intra-firm diversity”. As a consequence, there should be no conflict between private and social interests with respect to the predominant degree of “diversity”.

Therefore, in the following we want to turn to the question whether we can indeed expect firms to compensate a reduced “inter-firm-diversity” by an increased “intra-firm-diversity”. For this purpose we will analyze the corporate entrepreneurship literature in more detail. In doing so we want to find out whether we can identify certain requirements that have to be fulfilled - or at least particular determinates which influence the successful implementation of CE.

V. FACTORS DETERMINING CORPORATE ENTREPRENEURSHIP

To ensure an effectively working CE in corporations a number of requirements, instruments, strategies and mechanisms were brought forward by the existing literature. In a comprehensive bibliographic analysis we found numerous factors as being decisive for the successful implementation of Corporate Entrepreneurship. These factors can be classified into five categories (based on Morris and Trotter⁹⁶, Srivastava and Agrawal⁹⁷, and Ireland et al.⁹⁸), presented in the latter.

⁹⁶ See Morris & Trotter, *supra* note 92, at 132 *et seq.*

A. Organizational Structure

From a management perspective, the organizational structure describes the formal interrelating of individuals and groupings in allocation of assignments, responsibilities and authority to accomplish the goals of the corporation.⁹⁹ Facilitating entrepreneurship in large corporations requires a step away from the traditional conceptualization of the entrepreneur as a highly individualistic thinking and acting individual, towards approaching entrepreneurship as an organizational process. As a process, entrepreneurship is concerned with identifying and encouraging innovativeness, risk-taking and proactiveness within corporations.¹⁰⁰ The corporate structure determines to a large amount the outcome of any CE activity.¹⁰¹ Entrepreneurial organizations mirror flatter hierarchies, wider divisions of labor, wider span of authority and tend to be decentralized. Empirically, decentralized decision making has been positively linked with fostering CE.¹⁰² Hornsby et al. find that high levels of work discretion and low organizational boundaries are positively linked with entrepreneurial activity within corporations.¹⁰³ Furthermore, Jennings and Seaman examine organizational structures regarding entrepreneurial activity, finding that organizations with organic structures are more likely to engage in CE activity than organizations with mechanistic structures.¹⁰⁴ Quinn as well as Naisbitt put the idea forward that large corporations can only stay innovative by behaving like small entrepreneurial ventures.¹⁰⁵ This encompasses that corporations should act and operate in independent entities to generate Innovations¹⁰⁶. Or as Srivastava and Agrawal put it:

⁹⁷ See Nidhi Srivastava & Anand Agrawal, *Factors Supporting Corporate Entrepreneurship: An Exploratory Study*, 14 J. BUS. PERSP. 163 (2010).

⁹⁸ See Ireland et al., *supra* note 57.

⁹⁹ See GARETH R. JONES, *ORGANIZATIONAL THEORY, DESIGN, AND CHANGE* (5th ed. Prentice Hall 2006).

¹⁰⁰ See Robert D. Russell & Craig J. Russel, *An Examination Of The Effects Of Organizational Norms, Organizational Structure And Environmental Uncertainty On Entrepreneurial Strategy*, 18 J. MANAGE. 639 (1992).

¹⁰¹ See Srivastava & Agrawal et al., *supra* note 97, at 165 *et seq.*

¹⁰² See Dennis H. Ferguson et al., *Intrapreneuring In Hospitality Organizations*, 6 INT. J. HOSP. MANAG. 23 (1987); Bhardwaj & Kirankumar et al., *supra* note 88, at 132 *et seq.*

¹⁰³ See Jeffrey S. Hornsby et al., *Middle Managers' Perception Of The Internal Environment For Corporate Entrepreneurship: Assessing A Measurement Scale*, 17 J. BUS. VENTURING 253 (2002).

¹⁰⁴ See Daniel F. Jennings & Samuel L. Seaman, *Aggressiveness Of Response To New Business Opportunities Following Deregulation: An Empirical Study Of Established Financial Firms*, 5 J. BUS. VENTURING 177 (1990).

¹⁰⁵ See James B. Quinn, *Managing Innovation: Controlled Chaos*, 63 HARVARD BUS. REV. 73 (1985); JOHN NAISBITT, *GLOBAL PARADOX* (Nicholas Brealey Publishing, London 1994).

¹⁰⁶ See Allan Gibb, *Corporate Restructuring And Entrepreneurship: What Can Large Organizations Learn From Small?*, 1 IJEIMS 19 (2000).

“[...] corporate entrepreneurship is basically an organisational mode, characterized by the factors of freedom and autonomy, allowing employees to innovate.”¹⁰⁷

B. Corporate Culture

The corporate culture is described as a cognitive framework or collective thoughts within corporations concerning common attitudes, values, habits, patterns of behavior and expectations from employees.¹⁰⁸ It is influenced by several factors, such as the industry, the geographic heritage, past events, the individual characteristics of its employees and their patterns of interaction.¹⁰⁹

It is argued that entrepreneurial behavior within a corporation can only be effectively created and controlled through an appropriate corporate culture.¹¹⁰ Kanter states that corporate cultures that encourage change over tradition stimulate innovation, which is the underlying theme of all corporate entrepreneurial endeavors.¹¹¹ In general, corporations can be described as conservative or entrepreneurial, where the latter has been associated with superior performance.¹¹² For instance Morris et al. find that CE is highest under conditions of balanced individualism-collectivism.¹¹³ Moreover it declines in highly individualistic and more collectivistic environments. A corporate culture that will support CE has to rely on shared beliefs, values and non-conservative approaches to risk-taking.¹¹⁴ These shared beliefs and values have to be sustained and fostered in the long term, to be results-producing.¹¹⁵ It is also mentioned in the literature that if employees lack entrepreneurial spirit it can be transmitted via corporate culture.¹¹⁶

¹⁰⁷ Srivastava & Agrawal et al., *supra* note 97, at 165 *et seq.*

¹⁰⁸ See JERALD GREENBERG & ROBERT A. BARON, *BEHAVIOR IN ORGANIZATIONS* (Prentice Hall 1997); Mark N. Clemente & David S. Greenspan, Culture Clashes, 16 *EXECUTIVE EXCELLENCE* 12 (1999).

¹⁰⁹ See Golnaz Sadri & Brian Lees, *Developing Corporate Culture As A Competitive Advantage*, 20 *J. MANAGE. DEV.* 853 (2001).

¹¹⁰ See Chung & Gibbons, *supra* note 67, at 18 *et seq.*

¹¹¹ See Rosabeth M. Kanter, *When A Thousand Flowers Bloom: Structural, Social And Collective Conditions For Innovation Organizations*, in 10 *RESEARCH IN ORGANIZATIONAL BEHAVIOR* 169 (Barry M. Staw & Larry L. Cummings eds., Greenwich 1988).

¹¹² See Jeffrey G. Gown, *Entrepreneurial Versus Conservative Firms: A Comparison Of Strategies And Performance*, 28 *J. MANAGE. STUD.* 439 (1991).

¹¹³ See Michael H. Morris et al., *Individualism and the Modern Corporation: Implications for Innovation and Entrepreneurship*, 19 *J. MANAGE.* 595 (1993).

¹¹⁴ See Ferguson et al., *supra* note 102, at 27 *et seq.*

¹¹⁵ See Bhardwai & Momaya, *supra* note 88, at 41 *et seq.*

¹¹⁶ See Morris & Trotter, *supra* note 92, at 133 *et seq.*

C. Human Resource Management (HRM)

HRM can be described as both means and end to realizing the strategic objectives of corporations.¹¹⁷ As means, HRM is supposed to help direct employee mind-sets and actions toward achieving the goals of the corporation, for instance training staff to actively pursue and exploit entrepreneurial opportunities. As an end, HRM principles can be embodied in the process and systems that engender the long-term physical, social, and economic well-being of the employees.¹¹⁸ The HRM has been repeatedly associated with entrepreneurial activity in corporations.¹¹⁹ Concerning CE, the HRM is supposed to sensitize and create the awareness among the staff regarding entrepreneurial matters. Schmelter et al. find positive empirical support of staff selection, staff development, staff rewards and training on CE.¹²⁰

It is often examined within the literature that fostering the right incentives with an appropriate rewards and reinforcement system is beneficiary for employing effectively CE.¹²¹ To continue, an effective reward system that promotes CE activity must consider goals, feedback, emphasis on individual responsibility and results-based incentives.¹²² Lerner et al. argue that the compensation of the employees is highly relevant to effectually fostering CE, finding that entrepreneurial oriented employees prefer to be involved in the venture performance.¹²³ Seborá et al. find in a study that the management support and the elaborate utilization of rewards and recognition is a promoting factor for CE activities.¹²⁴ Hayton investigates empirically SMEs and finds that HRM practices that promote employee discretionary behavior, knowledge sharing, and organizational learning can be positively linked with CE.¹²⁵ HRM practices that promote CE should contain various measures including behavior and attitude, extensive training, training on the job skills, written constructions and procedures, team activities, training in multiple functions, incentive to meet objectives, communication of strategy, interaction facilitates, feedback on performance.¹²⁶ Melissa Cardon even argues that employees often lack passion for CE, and it can be

¹¹⁷ See MARK A. HUSELID ET AL., *THE WORKFORCE SCORECARD: MANAGING HUMAN CAPITAL TO EXECUTE STRATEGY* (Boston/Mass, Harvard Business School Press 2005).

¹¹⁸ See Sully Taylor et al., *Guest Editors' Introduction: Introduction To Hrm's Role In Sustainability: Systems, Strategies, And Practices*, 51 HUM. RESOURCE MANAGE. 789 (2012).

¹¹⁹ See Judith W. Tansky et al., *What's Next? Linking Entrepreneurship And Human Resource Management In Globalization*, 49 HUM. RESOURCE MANAGE. 689 (2010).

¹²⁰ See Schmelter et al., *supra* note 80, at 716 *et seq.*

¹²¹ See Hornsby et al., *supra* note 103, at 253 *et seq.*; Holt et al., *supra* note 78, at 43 *et seq.*; Hostager et al., *supra* note 57, at 16 *et seq.*

¹²² See Hornsby et al., *supra* note 103, at 257 *et seq.*

¹²³ See Miri Lerner, *The Role of Compensation Methods in Corporate Entrepreneurship* 39 INT. STU. OF MANAGE. 53 (2009).

¹²⁴ See Terrence C. Seborá, et al., *Corporate entrepreneurship in the face of changing competition: A case analysis of six Thai manufacturing firms*, 23 J. ORGAN. CHANGE MANAG. 453 (2010).

¹²⁵ See Hayton., *supra* note 57, at 377 *et seq.*

¹²⁶ See Kaya, *supra* note 75, at 2078 *et seq.*

transferred from entrepreneurs to employees.¹²⁷ Moreover the HRM is supposed to recruit the right staff, ideally staff with ‘entrepreneurial spirit’.¹²⁸ This seems to be hardly possible since most academics widely agree that there is no unique set of individual traits or personal origins which will perfectly determine an ‘entrepreneurial’ personality.¹²⁹ Some studies even conclude that personal characteristics do not influence CE.¹³⁰

D. Corporate Strategy

The corporate Strategy is the selection and development of the industries or markets, in which corporations seek to compete in.¹³¹ Apart from the organizational structure it is the most important aspects of the successful implementation of CE. Concerning innovative work behavior, the exact formulation of a corporate strategy, the commitment of the board and the direct management support appear as the most important aspects.¹³²

A corporate strategy that entails the necessary means to deliver and support adequate resources is the key for employing CE activities.¹³³ Another important aspect is the long term commitment of the board or Senior Executives.¹³⁴ For instance Fergueson et al. argue, that there needs to be entrepreneurial leadership at the top of the firm.¹³⁵ The willingness of managers to facilitate and promote entrepreneurial activity can take many forms, including championing ideas, providing expertise or necessary resources, or institutionalizing CE activity within the firm’s system and processes.¹³⁶

Zahra et al. empirically supports the hypothesis that CE requires strong and continued support from the top-executives of a corporation.¹³⁷ The formulated strategy affects heavily the amount of entrepreneurial activity within corporation. For instance Jennings and Seaman find that a prospector strategy leads to higher levels of entrepreneurial activity than a defender

¹²⁷ See Melissa S. Cardon, *Is Passion Contagious? The Transference Of Entrepreneurial Passion To Employees*, 18 HUM. RESOUR. MANAGE. R. 77 (2008).

¹²⁸ See Ferguson et al., *supra* note 102, at 29 *et seq.*, Morris & Trotter, *supra* note 92, at 136 *et seq.*

¹²⁹ See Gordon R. Foxall & Aron L. Minkes, *Beyond Marketing: The Diffusion Of Entrepreneurship In The Modern corporation*, 4 J. STRAT. MARKET 71 (1996).

¹³⁰ See Holt et al., *supra* note 78, at 44 *et seq.*

¹³¹ See RICHARD P. RUMELT, STRATEGY, STRUCTURE, AND ECONOMIC PERFORMANCE (Cambridge/Mass, Harvard University Press 1974).

¹³² See Bruce R. Barringer & Allen C. Bluedorn, *The Relationship Between Corporate Entrepreneurship And Strategic Management*, 20 STRATEGIC MANAGE. J. 421 (1999); JEROEN DE JONG, INDIVIDUAL INNOVATION: THE CONNECTION BETWEEN LEADERSHIP AND EMPLOYEE’S INNOVATIVE WORK BEHAVIOUR (Zoetermeer, Scales Research Reports from EIM Business and Policy Research 2007); Srivastava & Agrawal et al., *supra* note 97, at 168 *et seq.*

¹³³ See Hornsby et al., *supra* note 103, at 255 *et seq.*

¹³⁴ See Zahra, *supra* note 56, at 1714 *et seq.*; Zahra & Govin., *supra* note 75 at 46 *et seq.*

¹³⁵ See Ferguson et al., *supra* note 102, at 26 *et seq.*

¹³⁶ See Hornsby et al., *supra* note 103, at 254 *et seq.*

¹³⁷ See Shaker A. Zahra et al., *Entrepreneurship In Medium-Size Companies: Exploring The Effects Of Ownership And Governance Systems*, 26 J. MANAGE. 947 (2000).

strategy.¹³⁸ A prospector strategy is to innovate, take risks and seek out new opportunities, while a defender strategy is primarily focused on stability and internal efficiency.¹³⁹

E. Extern

This describes the factors which are not internal to corporations. The concept of external environment is supposed to include those forces and elements external to the organization's boundaries that affect and are affected by an organization's behavior and the general sociocultural, economic, political-legal, and technological efforts which accommodate the broader framework for the organization's operations. This indicates that potential influences are widespread, Schindehutte et al. identified in a meta-analysis about 20 external "key-triggers" of CE activity.¹⁴⁰

Still, most scholars identified the industry structure as the most influential external variable for CE activities.¹⁴¹ For example, CE is also affected by the competitive structure or the environment it is facing. Zahra and Covin prove empirically that CE practices are particularly effective among companies which are operating in hostile environments.¹⁴² Moreover Guth and Ginsberg showed that environmental changes in industry competitive structure and the underlying technologies influence CE.¹⁴³ Nikiforou find in study on Greek firms that market structural holes and technological dissimilar information positively influence CE, whereas market dissimilar information and technological structural holes do not affect CE activities.¹⁴⁴ Romero-Martinez et al. find that state-owned enterprises increase their level of CE activity after privatization, especially in highly competitive industries.¹⁴⁵ Miller et al. find that dynamic environments have been found to encourage CE.¹⁴⁶ The political-legal forces are highlighted by Kent and Kilby which supposedly possess a great impact on the pervasiveness

¹³⁸ See Jennings & Seaman, *supra* note 104.

¹³⁹ See RICHARD L. DAFT ET AL., ORGANIZATION THEORY AND PRACTICE (Cengage/Hampshire 2010).

¹⁴⁰ See Minet Schindehutte et al., *Triggering events, corporate entrepreneurship and the marketing function*, 8 JMTP 18 (2000).

¹⁴¹ See E. R. BIGGADIKE, CORPORATE DIVERSIFICATION: ENTRY, STRATEGY AND PERFORMANCE. BOSTON: DIVISION OF RESEARCH, (Harvard University. 1976); P.P. McDougall & R.B. Robinson, *New venture performance: Patterns of strategic behavior in different industries*, in FRONTIERS OF ENTREPRENEURSHIP RESEARCH 447 (B. A. Kirchoff et al. Eds, Wellesley, MA: Babson College., 1988); W. R. Sandberg, & C. W. Hofer, C. W., *Improving new venture performance: The role of strategy, industry structure, and the entrepreneur*, 2 J. BUS. VENTURING 5 (1987).

¹⁴² See Zahra & Govin., *supra* note 75, at 48 *et seq.*

¹⁴³ See Guth & Ginsberg, *supra* note 68.

¹⁴⁴ See Argyro Nikiforou et al., *The impact of networks on corporate entrepreneurship: lost in the structural holes*, 31 FR. ENTREP. RESEARCH 15 (2011).

¹⁴⁵ See Ana M. Romero-Martinez et al, *Exploring corporate entrepreneurship in privatized firms*, 45 J. WORLD BUS. 2 (2010).

¹⁴⁶ See Dirk Miller et al., *Strategic process and content as mediators between organizational context and structure*, 31 ACAD. MANAGE. J. 554 (1988).

and success of CE.¹⁴⁷ Kathuria and Joshi even find that growth and the encompassing challenges and opportunities by the internet forces existing firms to consider CE as a reasonable response to maintain their existence.¹⁴⁸

VI. DISCUSSION

As shown above, the strategic management literature provides evidence that firms do consider CE in order to foster innovations. Hence, on this basis it can be suggested that firms should indeed have a strong incentive to create/preserve “diversity” in-house. However, in the last chapter it was also demonstrated that the successful implementation of CE and therefore a successful preservation/creation of “intra-firm diversity” requires that CE has to be embedded in the appropriate organizational environment. Such a CE-friendly environment can be characterized by the proper interplay of the factors which were brought forward within the five introduced categories (organizational structure, corporate culture, HRM, corporate strategy and extern) of the last chapter. Hence, besides the extremely unlikely case in which a firm possesses such a CE-friendly environment automatically, it has to change its organizational structure, corporate culture, human resource management and corporate strategy in order to ensure a successful implementation of CE. As a consequence, it can be concluded that the willingness and ability to successfully change these factors towards a CE-friendly environment will, at the end of the day, also determine whether the implementation of CE will be successful or not. But, apart from the fact that the modification of the external factors is outside the scope of the firm, the attempt of changing the remaining internal factors is an ambitious and very risky undertaking.

In regard to organizational change it is first of all worth mentioning that firms are generally very reluctant with respect to the attempt of changing their organizational structure, even though these changes are expected to improve their performance.¹⁴⁹ This phenomenon, often called “structural inertia”¹⁵⁰, is remarkable at first sight. However, there are several plausible explanations why firms try to avoid organizational change. In the population ecology literature, for example, it is argued that stable organizations with standardized routines create

¹⁴⁷ See PETER KILBY, *ENTREPRENEURSHIP AND ECONOMIC DEVELOPMENT* (New York: The Free Press, 1971); C.A. KENT, *THE ENCYCLOPEDIA FOR ENTREPRENEURSHIP* (Lexington, MA, 1984).

¹⁴⁸ See Ravi Kathuria & Joshi, P. Maheshkumar, *Environmental influences on corporate entrepreneurship: executive perspectives on the internet*, 3 INT. ENTREP. MANAG. J. 127 (2007).

¹⁴⁹ See Massimo G. Colombo and Marco Delmastro, *The Determinants of Organizational Change and Structural Inertia: Technological and Organizational Factors*, 11 J. ECON. MANAGE. STRAT. 595, at 596 (2002).

¹⁵⁰ See JOHN P. KOTTER, *LEADING CHANGE* (Harvard Business Review Press 1996); Colombo and Delmastro, *supra* note 149, at 596.

an environment of reliability and accountability - two properties that can constitute an advantage in the evolutionary process of variation and selection.¹⁵¹ If this is the case, it would imply that many firms which have remained in saturated industries most likely possess a rather stable organizational structure. This theoretical explanation fits very well to the observation of Morris & Trotter who argue that:

“There is, in fact, a natural tendency for companies to lose the entrepreneurial spirit, and build internal constraints on entrepreneurship, as they evolve through the organizational life cycle.”¹⁵²

And

“These systems seek to provide stability, order, and coordination to an increasingly complex internal corporate environment. The trade-off, however, is a strong disincentive for entrepreneurship.”¹⁵³

By assuming bounded rationality of economic agents and decision making costs under uncertainty, another explanation for structural inertia was brought forward by the behavioralist theorists of organizations.¹⁵⁴ Since, under such a setting, there is no guaranty that a change of the organizational structure will be successful, firms might prefer to stick to their current structure until a very poor performance forces them to change.¹⁵⁵ Yet another approach in order to explain the phenomenon of structural inertia can be found in the necessity of effectively monitoring subordinates.¹⁵⁶ The larger the firm size the more levels of hierarchies are needed in order to ensure an effective monitoring of subordinates and thereby a previously arranged level of working morale and effort.

A change or transformation of the organizational culture does not appear to be an easier task. For over the last three decades academics and practitioners have struggled in transforming or changing organizations culture.¹⁵⁷ The process of cultural change is contradicted by an elementary aspect of organizations.¹⁵⁸ Organizational culture, understood as a coherent system of common assumptions and basic values which differentiate one group

¹⁵¹ See Michael T. Hannan and John Freeman, *Structural Inertia and Organizational Change*, 49 AM. SOCIOL. REV. 149 (1984); Colombo and Delmastro, *supra* note 149, at 596 *et seq.*

¹⁵² Morris and Trotter, *supra* note 92, at 132.

¹⁵³ *Id.*, at 134.

¹⁵⁴ See JAMES G. MARCH AND HERBERT SIMON, *ORGANIZATIONS* (Wiley 1958); RICHARD M. CYERT AND JAMES G. MARCH, *A BEHAVIORAL THEORY OF THE FIRM* (Englewood Cliffs 1963); Colombo and Delmastro, *supra* note 149, at 596.

¹⁵⁵ See Colombo and Delmastro, *supra* note 149, at 596.

¹⁵⁶ See Oliver E. Williamson, *Hierarchical Control and Optimum Firm Size*, 75 J. POLIT. ECON. 123 (1967); Yingyi Qian, *Incentives and Loss of Control in an Optimal Hierarchy*, 61 REV. ECON. STUD. 527 (1994); Colombo and Delmastro, *supra* note 149, at 600.

¹⁵⁷ See Harold L. Sirkin et al., *The hard side of change management*, HARVARD BUS. REV. 109 (2005).

¹⁵⁸ See Gerry, Johnson, *Managing Strategic Change: Strategy, Culture and Action* 25 LONG RANGE PLANN. 28 (1992).

from another is, by its very nature, a persistent and generally unalterable phenomenon. The more deeply-rooted and disperse the values are, the more unchangeable the culture gets. However, it is still possible to inject new directions into these values, but only at extreme high organizational costs.¹⁵⁹ Empirical findings suggest that after releasing pressure on the cultural change process, organizations tend to return or lean towards its original cultural state.¹⁶⁰ In a meta-analysis, Smith reviewed studies on cultural change and finds that the overall success rate for cultural change is low.¹⁶¹

The observations with respect to structural and cultural change also hold for organizational change more generally. Sirkin et al., for example, found that two out of every three transformation programs fail¹⁶² and Strebel discovered that the success rates of corporate reengineering in Fortune 1000 companies are between 20 and 50%.¹⁶³ These poor rates of success in regard to organizational change might be the reason that made Morris et al. state:

“[...] many companies are not very good at corporate venturing, or creating new businesses within their existing business.”¹⁶⁴

VII. CONCLUSION

We found that the relevance of “diversity” and “parallel research” for innovation is well-known to researchers working in the field of strategic management. Especially the extensive Corporate Entrepreneurship literature suggests that the creation of “intra-firm-diversity” is indeed considered as an important factor for the innovativeness and general performance of firms. Hence, one can conclude that even merged entities should have an incentive to create/preserve “diversity” in-house and thereby balance a reduction in the “inter-firm-diversity” as a consequence of a merger by an increase in “intra-firm-diversity”. However, we furthermore discovered that the successful implementation of “intra-firm-diversity” is a very ambitious undertaking which demands that numerous requirements are fulfilled and which furthermore often tends to fail.

¹⁵⁹ See Pasquale Gagliardi, *The Creation and Change of Organizational Cultures: A Conceptual Framework*, 7 ORGAN. STUD. 117, at 121 *et seq.* (1986).

¹⁶⁰ See Elaine Romanelli & Michael L. Tushman, *Organizational Transformation as Punctuated Equilibrium: An Empirical Test*, 37 ACAD. MANAGE. J. 1141 (1994); Shoou-Yih and Daniel Lee et al., *Organizational Transformation A Systematic Review of Empirical Research in Health Care and Other Industries*, 70 MED. CARE RES. REV. 115 (2013).

¹⁶¹ See Martin, Smith, *Changing an organization's culture: correlates of success and failure*, 24 LEAD. & ORG. DEV. J. 249 (2003).

¹⁶² See Harold L. Sirkin et al., *supra* note 157.

¹⁶³ Paul Strebel, *Why do Employees Resist Change?* HARVARD BUS. REV. 86 (1996).

¹⁶⁴ See Morris et al., *supra* note 56, at 87.

Hence, what conclusions can be drawn from a competition policy perspective? Is the fact, that the successful implementation of “intra-firm-diversity” is apparently not an easy task an ample reason for the intervention of antitrust agencies in the review process of mergers? Can mergers and acquisitions themselves not be understood as experimentation on an organizational level and therefore as an inherent part of the overall evolutionary process of trial and error in which only the best solutions and most capable firms will prevail? Shouldn’t firms that have the capability to successfully implement “intra-firm-diversity” be rewarded by a higher innovativeness and a superior performance while the firms that lack these capabilities would simply disappear? As a consequence, it can be questioned why competition authorities should protect “inter-firm diversity” with the ultimate goal that a variety of sources for the generation of future innovations is secured and parallel experimentation is rendered possible, while they restrain the experimental process on the organizational level at the same time.

Giving an answer to this question is probably not an easy task and should be subject to further research. However, it can be suggested that the crucial aspect in order to answer this question might be the existence and relevance of entry barriers for the participation in the process of innovation competition. These kinds of entry barriers became known under the term “specialized assets”¹⁶⁵ and are considered as assets which are indispensable, as well as difficult to acquire and adopt, for innovations in a certain technology field. As a consequence, whenever competition authorities fail to identify such “specialized assets”, a loss of “diversity” should simply get balanced by new entrants – regardless of whether the merging parties succeed or fail to create/preserve “diversity” in-house. However, whenever these entry barriers are high and the competitive structure is furthermore already highly concentrated, the assessment becomes more delicate. Under such a setting it can indeed be advisable to challenge a certain transaction and thus suppress the process of experimentation on an organizational level in order protect “inter-firm-diversity” and thereby the process of parallel experimentation as well as potential sources for future innovations.

¹⁶⁵ See Richard J. Gilbert & Steven C. Sunshine, *supra* note 1.

Essay VI:

Die Entwicklung der technologischen Wissensbasis in technologiegetriebenen Industrien am Beispiel der deutschen Solarindustrie – Eine empirische Analyse der Akteure und ihrer Herkunft

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Status: *Veröffentlicht in: Discussion Papers on Strategy and Innovation, 11-05, 1-28.*

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***Die Entwicklung der technologischen
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Industrien am Beispiel der deutschen
Solarbranche***

– Eine empirische Analyse der Akteure und ihrer Herkunft –

*Discussion Paper 11-05
Marburg, Dezember 2011
ISSN 1864-2039*

Abstract

Die Entstehung von Technologien und Industrien ist ein vielschichtiger und komplexer Prozess. Lebenszykluskonzepte, welche dem evolutorischen Grundgedanken entlehnt sind, versuchen Phasen und Muster der zeitlichen Entwicklung von Objekten nachzuzeichnen. Im vorliegenden Diskussionspapier soll die Entfaltung der Solartechnologie und der deutschen Solarbranche analysiert werden. Die Branche gilt als eine der dynamischsten und wissensintensivsten der deutschen Industrie, zugleich aber auch als eine der subventionsabhängigsten.

Das Ziel des vorliegenden Beitrags liegt in der Identifikation, Beschreibung und Klassifizierung derjenigen Akteure, die in verschiedenen Phasen der Diffusion der solarindustriespezifischen Schlüsseltechnologie eine relevante Rolle spielen. Es zeigt sich, dass der Eintritt in die Solar-Schlüsseltechnologiefelder bevorzugt durch die technologische Diversifikation von Unternehmen erfolgt. Eine zunehmende Bedeutung einzelner Akteursgruppen im Verlauf des Industrie- und Technologielebenszyklus konnte nicht nachgewiesen werden. Die Anzahl der akteursgruppenbezogenen Markteintritte blieb über den Betrachtungszeitraum hinweg relativ konstant, dies deutet einerseits daraufhin, dass sich diese Branche immer noch in der Wachstumsphase befindet, andererseits führen die angebots- sowie nachfrageseitigen Subventionen zu erheblichen Verzerrungen in der Branche.

Aufbauend auf diesen Erkenntnissen wurde die These formuliert, dass die Scheiterungswahrscheinlichkeit von Neugründungen in den frühen Phasen des Lebenszyklus aufgrund der intensiven, öffentlichen Förderung tendenziell geringer ist. Diese Annahme konnte bestätigt werden. Bemerkenswert ist in diesem Kontext, dass im Falle des Scheiterns gerade diejenigen Unternehmen die höchste Überlebensdauer aufweisen, die in vergleichsweise frühen Jahren des Industrielbenszyklus gegründet wurden. Es kommt vermeintlich zu einer Art „verspäteten“ Insolvenz. Ob sich diese Tatsache ausschließlich auf die intensive, öffentliche Förderung zurückführen lässt, konnte jedoch noch nicht abschließend geklärt werden.

Schlüsselwörter:

Industrielbenszyklus, Technologielebenszyklus, Solartechnologie, Patente

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1 Einleitung

Neue Technologien sind eine wesentliche Triebkraft technologischen Fortschritts und wirtschaftlicher Entwicklung. Die Frage, welche Arten von Akteuren neue Technologien vorantreiben und welche Charakteristika die verschiedenen Akteursgruppen besitzen, sind wichtige ökonomische Fragestellungen mit gleichzeitig hoher politischer Relevanz. Vorangegangene Untersuchungen im Kontext dieser Fragestellungen beschränken sich bisher im Wesentlichen auf Fallstudien, meist von einzelnen Unternehmen oder Regionen.¹

In diesem Papier wird für eine bestimmte Technologie die Herkunft aller patentaktiven Akteure in Deutschland untersucht. Damit soll analysiert werden, welche Akteurstypen eine Technologie vorantreiben und wie sich die Zusammensetzung dieser Akteurspopulation über den Zeitverlauf hinweg ändert. Den industriellen Rahmen der Untersuchung bildet die Solartechnologie. Die relevanten Akteure werden anhand von Patentdaten identifiziert. Insgesamt ergibt sich eine Akteursgruppe von 138 Unternehmen, welche die im weiteren Verlauf der Arbeit genau definierten Kriterien erfüllen. Zur Einordnung dieser 138 Unternehmen in verschiedene Gruppen werden zahlreiche Eigenschaften bestimmt, um damit ihre Herkunft, räumliche Verteilung und Entwicklung untersuchen zu können.

Das Papier ist wie folgt aufgebaut: Zunächst werden die theoretischen Grundlagen geschaffen und ein Überblick der Solarbranche gegeben. Dann wird in Kapitel 3 die methodische Vorgehensweise beschrieben. In Kapitel 4 werden die Ergebnisse präsentiert. Eine Zusammenfassung bietet Kapitel 5, während Kapitel 6 einen Ausblick enthält.

2 Theoretische Grundlagen

In der ökonomischen Literatur existiert eine schiere Vielfalt unterschiedlicher Lebenszykluskonzepte.² Die vorliegende Arbeit analysiert die Entwicklung einer Schlüsseltechnologie, die eine fokussierte Anwendung in einem Produktbereich der Solarindustrie findet. Die im Untersuchungsfokus stehende Technologie weist damit – ganz bewusst – industriespezifischen und nicht generischen Charakter auf. Die vorliegende Analyse positioniert sich damit in der Schnittmenge zwischen den Konzepten des Industrielbenszyklus und des Technologielebenszyklus.

¹ Vgl. Gao, et al (2011); Liu et al. (2011); Yeh (2005); Lai (2003); Donald (1998), Malerba/Orsenigo (1993), Malerba/Orsenigo (1993).

² Vgl. hierzu u.a. Ford, D. / Ryan, C. (1981), Tiefel, T. (2007), Tiefel, T. (2010), Höft, U. (1992), Utterback, J. / Abernathy, W. (1975). Sommerlatte, T. / Walsh, S. (1983), Sommerlatte, T. / Deschamps, J. (1985).

2.1 Technologielebenszyklus

Der Terminus ‚Technologielebenszyklus‘ basiert auf der Annahme, dass im Verlauf der Entwicklung einer Technologie Regelmäßigkeiten auftreten, die dem Muster und den Phasen biologischer bzw. organischer Prozesse ähneln.³ Dementsprechend gibt es auch bei Technologien mehrere zeitabhängige Entwicklungsstufen. Generell kann davon ausgegangen werden, dass die Attraktivität einer Technologie stark von der Lebenszyklusphase bestimmt wird, in welcher sich die Technologie befindet.⁴ Bei der Darstellung eines Technologielebenszyklusmodells geht es ganz allgemein darum, einen gesetzmäßigen Zusammenhang zwischen der zeitlichen Dimension und leistungs- oder nachfragebezogenen Parametern der Technologieentwicklung zu identifizieren und abzubilden.⁵ Die jeweiligen Phasen eines Technologielebenszyklus können anhand der Leistungsfähigkeit oder dem Diffusionsgrad der Technologie differenziert werden. Je nach Lebenszyklusphase können folgende Technologietypen unterschieden werden:

- ▶ *Embryonische Technologien*: Dies sind neu entstehende Technologien mit höchst unsicherem Entwicklungs- und Anwendungspotential, sie besitzen einen ausgesprochen explorativen Charakter.
- ▶ *Schrittmachertechnologien*: Darunter werden neu entwickelte Technologien mit großem Weiterentwicklungspotential verstanden. Sie befinden sich zumeist noch im Stadium der Entwicklung und sind deshalb für eine breite Anwendung noch nicht ausgereift. Darüber hinaus bestehen Unsicherheiten bezüglich ihrer Potentiale zum Aufbau von Wettbewerbsvorteilen, aber auch hinsichtlich ihrer technischen Realisierbarkeit und Leistungsfähigkeit.
- ▶ *Schlüsseltechnologien*: Diese finden zunehmend am Markt Anwendung, wobei es sich aber noch um neue Technologien mit einigem Weiterentwicklungs- und Wettbewerbsdifferenzierungspotential handelt. Schlüsseltechnologien sind in der Regel noch nicht allgemein verbreitet, sondern beschränken sich überwiegend auf einen exklusiven Anwenderkreis.
- ▶ *Basistechnologien*: Die Technologien dieses Typus gelten als ausgereift und werden in der Regel von allen Akteuren am Markt beherrscht. Sie sind damit nicht mehr differenzierungsrelevant für den Wettbewerb.

Die Festlegung und Abgrenzung der unterschiedlichen Phasen des Technologielebenszyklus ist in der Praxis aufgrund des Fehlens eindeutiger qualitativer und/oder quantitativer Indikato-

³ Vgl. Tiefel (2007), S.25 ff.

⁴ Vgl. Soppe, B. / Stephan, M. (2006), S. 9 f.

⁵ Vgl. Tiefel, T. (2007), S. 26 ff. Für das nachfragebezogene Technologielebenszyklus-Modell hat sich der Ansatz von Ford / Ryan (1981), und für den leistungsbezogenen der Ansatz von Arthur D. Little (Sommerlatte, T. / Deschamps, J. (1985), Sommerlatte, T. / Walsh, S. (1983)) als bedeutende Ansätze herauskristallisiert:

ren kaum vornehmbar. In der Literatur bildet diese Problematik einen starken Kritikpunkt am Lebenszykluskonzept.⁶ Folglich ist es von hohem wissenschaftlichem als auch praktischem Interesse, alternative Indikatoren zu identifizieren und zu nutzen, die zweifelsfrei auf eine bestimmte Technologielebenszyklusphase schließen lassen und dabei einfach quantifizierbar sind. Als objektive und vergleichbare Indikatoren werden häufig patentstatistische Kennzahlen herangezogen, um den Technologielebenszyklus abzubilden.⁷ Dennoch können Patente nicht als Allheilmittel gegen die Messprobleme bei der Analyse des Technologielebenszyklus betrachtet werden. Um den Diffusionsverlauf einer Technologie akkurat nachzuzeichnen, müssten alle Patentanmeldungen eines jeweiligen Technologiefeldes erfasst werden. Dies erscheint u.a. aufgrund folgender Aspekte nur bedingt möglich:

- ▶ Das Internationale Patentklassifikationssystem (IPC) ist eher branchen- als technologieorientiert. Die definierten Patentklassen lassen sich in den meisten Fällen nicht geschlossen einer Technologie bzw. einem Technologiefeld zuweisen.
- ▶ Patente werden häufig in mehreren IPC-Klassen gleichzeitig angemeldet. Dies hat methodische Fragen, insb. hinsichtlich einer intendierten Mehrfachzählung von Patenten, zur Folge.
- ▶ Unternehmen verfolgen individuelle Strategien beim Schutz ihres geistigen Eigentums. In Konsequenz können Patente mit unterschiedlicher geographischer Reichweite angemeldet werden (nationales Patent, europäisches Patent, Weltpatent). Diese Patente müssten in Summe Berücksichtigung finden und ggf. um Redundanzen bereinigt werden.
- ▶ Ebenfalls können sich Unternehmen bewusst gegen eine Patentierung und für die Geheimhaltung zum Schutz ihrer Innovationen entscheiden. Gründe hierfür können in strategischen Überlegungen oder einem sich schnell ändernden technologischen Wettbewerbsumfeld liegen.

Während die letztgenannten drei Punkte in der Literatur als Nachteile von Patentdaten zur Kenntnis genommen werden, überwiegen dennoch die Vorteile wie Datenverfügbarkeit, Vergleichbarkeit und Objektivität für die ökonomische Forschung.⁸ Mangels Alternative haben Patentdaten in der Forschung breite Anerkennung gefunden.

Für die Überführung von IPC-Klassen in Technologiefelder hat sich ein Konkordanzschema als Lösung etabliert. Die sog. ISI-OST-INPI-Klassifikation ordnet einzelnen IPC-Klassen

⁶ Vgl. Schuh, G. et al. (2011), S. 39, Tiefel, T. (2007), S. 46, Höft, U. (1992), S. 79 f, Haupt/Kloyer/Lange (2007) S.51 ff.

⁷ Vgl. Haupt, R. / Kloyer, M. / Lange, M. (2007a), S. 51, Gao, L. et al. (2011) gehen in ihrem Paper ausführlich auf Patent Dokumente als Indikatoren für den Technologielebenszyklus ein.

⁸ Vgl. Stephan (2003), S. 171ff.

Technologieklassen und -unterklassen zu.⁹ Entsprechend dieser Systematisierung sind die für die folgende Untersuchung relevanten Patente in den Solartechnologien in der Technologieunterklasse „solar energy“ mit der übergeordneten Technologiekategorie „energy“ angesiedelt.

2.2 Übersicht über die Solarbranche

Solartechnologien zählen zum übergeordneten Feld der Umwelttechnik, welches vom Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU) zu den wichtigsten Zukunftsmärkten des 21. Jahrhunderts gezählt wird. Die Umwelttechnik untergliedert sich in sechs Leitmärkte, wobei die Solartechnologien zum Leitmarkt ‚Umweltfreundliche Energien und Energiespeicherung‘ zählen. Weltweit wurden im Leitmarkt ‚Umweltfreundliche Energien und Energiespeicherung‘ im Jahr 2007 ca. 155 Mrd. Euro erwirtschaftet, bis zum Jahr 2020 wird ein Wachstum auf 615 Mrd. Euro erwartet. Innerhalb des Leitmarktes ‚Umweltfreundliche Energien und Energiespeicherung‘ gehört die Solartechnologie zum Produkt- und Technologiebereich der erneuerbaren Energien, neben Wasserkraft, Windkraft, Geothermie, Biogas- und Biomasse-Anlagen.¹⁰ Die Solartechnologie untergliedert sich einerseits in die Solarthermie und andererseits in die Photovoltaik. Während die solarthermischen Kraftwerke Energie aus Hochtemperaturwärme von in Spiegeln konzentrierten Sonnenstrahlen gewinnen, wird in der Photovoltaik Energie mit Hilfe von Solarzellen erzeugt.¹¹ Der Schwerpunkt der Darstellung im vorliegenden Artikel liegt auf der Photovoltaik.

Die deutsche Photovoltaikindustrie zeigte innerhalb der letzten Jahre ein starkes Wachstum (siehe Tabelle 1). Zwischen 2000 und 2008 erzielte die deutsche Photovoltaikindustrie durchschnittliche jährliche Wachstumsraten von fast 70 Prozent. Zum Ende des Jahres 2010 konnten rund 10.000 Unternehmen (inklusive Handwerker und Zulieferer) der Photovoltaikindustrie zugerechnet werden, davon lassen sich über 350 Unternehmen als Produzenten von Zellen, Modulen oder Komponenten einordnen.¹² Der geschätzte Umsatz der Photovoltaikindustrie in Deutschland betrug im Jahr 2010 rund 10 Mrd. Euro.

⁹ Vgl. Ebd., S. 187f..

¹⁰ Vgl. BMU (2009), S. 58.

¹¹ Photovoltaikanlagen wandeln Sonnenlicht direkt in elektrischen Strom um. Solarthermische Anlagen eignen sich zur Erwärmung von Trinkwasser und zur Aufbereitung von heißem Wasser für die Heizungsanlage. Mit Solarthermieanlagen lassen sich auch Kälte und Prozesswärme erzeugen (vgl. BMU, 2010).

¹² Vgl. Bundesverband Solarwirtschaft, Juni 2011

Tabelle 1: Umsätze der deutschen Photovoltaik-Industrie (Quelle: BSW-Solar, 2009)

Jahr	2000	2001	2002	2003	2004	2005	2006	2007	2008
Umsatz in Mio €	201	348	264	492	1.645	2.793	4.451	4.451	7.041

Weltweit wurden im Jahr 2007 neue Photovoltaikanlagen mit einer Gesamtleistung von 3.000 Megawattpeak in Betrieb genommen.¹³ Der Photovoltaik-Weltmarkt betrug im Jahr 2007 nach Angaben der European Photovoltaic Industry Association (EPIA) ca. 2.400 Megawattpeak, mit einer kumulierten weltweit installierten Leistung von 9.200 Megawattpeak. Nach Einschätzung des BSW-Solar auf Basis von Daten der National PV Associations wuchs der Weltmarkt im Jahr 2008 auf 5.750 Megawatt. Der Marktanteil deutscher Unternehmen liegt im Durchschnitt über alle Wertschöpfungsstufen hinweg bei rund 20 Prozent. Wirtschaftsexperten von ifo/EUPD-Research gehen davon aus, dass die exportstarken deutschen Solarunternehmen auch in den kommenden Jahren einen Weltmarktanteil von etwa einem Fünftel gegen wachsende Konkurrenz aus Fernost behaupten können werden.¹⁴ In den letzten Jahren stellte der Export, wie traditionell in der deutschen Wirtschaft, ein wichtiges Standbein dar. Die Exportquote stieg bis zum Jahr 2010 auf über 50 Prozent an (siehe Tabelle 2).

Tabelle 2: Auslandsumsatz (Quelle: BSW-Solar, 2009)

Export	2004	2005	2006	2007	2008
Auslandsumsatz in Mio. € (Industrie + Zulieferer)	273	603	1.695	2.922	3.700
Exportquote (Industrie)	14%	19%	34%	43%	46%
Exportquote (Zulieferer)	30%	31%	37%	51%	52%

Die Photovoltaikindustrie beschäftigte zum Jahresende 2010 über 150.000 Mitarbeiter und konnte ein Steueraufkommen von über 1,5 Mrd. € aufweisen.¹⁵ Zudem ist die Branche durch eine zunehmende Forschungs- und Entwicklungsintensität gekennzeichnet (siehe Tabelle 3).

¹³ Vgl. BMU (2009), S. 63; European Photovoltaic Industry Association (EPIA).

¹⁴ Vgl. Solarbusiness (2011).

¹⁵ Vgl. Solarbusiness (2011).

Tabelle 3: FuE-Aufwendungen Photovoltaikindustrie (Quelle: BSW-Solar, 2009)

Jahr	2001	2002	2003	2004	2005	2006	2007	2008
FuE in Mio. €	9,8	9,2	16,1	29,8	65,1	103,6	175,8	190

Der Solarbranche wird auch zukünftig eine tragende Rolle in der deutschen Wirtschaft zugemessen, allerdings verbunden mit einem zunehmend intensiveren und globalen Wettbewerb. So wird u.a. prognostiziert, dass bis zum Jahr 2020 die Exportquote der deutschen Photovoltaikindustrie bei ca. 80 Prozent liegen wird.¹⁶ Desweiteren kommt es durch die stetige Zunahme der Leistungsfähigkeit der Solartechnologien und der nachfrageseitigen Akzeptanz zu einer Annäherung der Industrie an die Netzparität.¹⁷ In Konsequenz haben einige Länder, u.a. auch Deutschland, bereits damit begonnen, die staatlichen Fördergelder zu reduzieren. Diese Entwicklung zieht eine zusätzliche Intensivierung des Wettbewerbes in der Solarbranche nach sich. Für europäische Industrieunternehmen, insbesondere für deutsche, stellt es eine große Herausforderung dar, sich zukünftig gegenüber der wachsenden ostasiatischen Konkurrenz zu behaupten.¹⁸

2.3 Industrielbenszyklus

Analog zum Technologielebenszyklus lässt sich die Annahme der fortwährend wiederkehrenden, organischen Prozessen entlehnten Phasen auch auf ganze Branchen bzw. Industrien beziehen. Grundannahme dieses sogenannten Industrielbenszykluskonzepts ist die Vorstellung, dass Industrien durch einen typischen Entwicklungsverlauf gekennzeichnet sind. Die Anzahl und Ausprägungen der jeweiligen Entwicklungsphasen werden in der Literatur kontrovers diskutiert. Es finden sich unterschiedliche Ansichten und Konzepte, bei der die Bestimmung geeigneter Phasenabgrenzungen und Indikatoren große Relevanz besitzt. Als objektive und eindeutige Abgrenzungskriterien werden in diesem Kontext häufig Marktgröße (Marktvolumen), kumulierter Produktionsausstoß, Wachstumsraten, Markteintritts- und Austrittsraten, Überlebenswahrscheinlichkeit sowie die Arten der Innovationen in der Branche betrachtet.

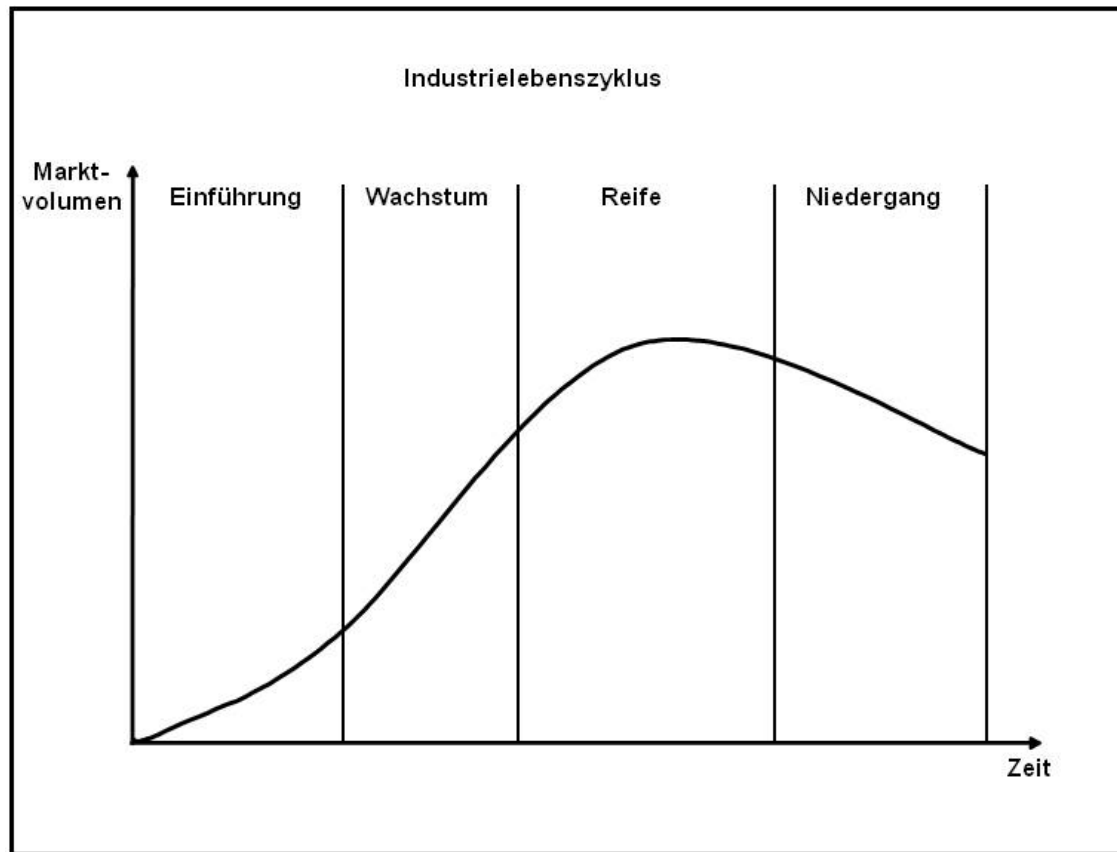
¹⁶ Vgl. RolandBerger/Prognos AG (2010).

¹⁷ Netzparität von Solarstrom bedeutet, dass der Preis für die Herstellung einer kWh Solarstrom nicht höher ist als der Endkundenpreis für Strom aus konventioneller Energieerzeugung. Die Definition der Netzparität bezieht sich nicht auf den Vergleich der Produktionskosten von Solarstrom mit den Kosten für aus fossilen Energieträgern erzeugtem Strom.

¹⁸ EPIA (2011).

Nachstehend findet sich die Darstellung eines idealtypischen Verlaufs eines Industrielbenszyklus, Abbildung 1 erklärt den Verlauf mit Hilfe von vier Phasen:¹⁹

Abb. 1: Idealtypischer Verlauf des Industrielbenszyklus (Quelle: Höft (1992), S. 105.)



- ▶ *Einführungsphase:* Die erste Phase beginnt mit der Kommerzialisierung eines neuen Produktes. Die neu entstehende Industrie ist gekennzeichnet durch ein geringes Marktvolumen und einen hohen Grad an Unsicherheit. Zum jetzigen Zeitpunkt hat sich noch kein Dominantes Design etabliert, die Unternehmen experimentieren mit unterschiedlichen Ansätzen. Der Markt lässt sich durch hohe Einstiegsraten und Wettbewerb, der auf Produktinnovationen basiert, charakterisieren. Die Dauer dieser Phase hängt entscheidend von der Fähigkeit der Wettbewerber ab, die Produkte des Erstinnovators zu kopieren, sowie von der Diffusion und Herausbildung des Dominanten Designs.
- ▶ *Wachstumsphase:* Das Entstehen eines Dominanten Designs markiert den Beginn dieser zweiten Phase und bietet die Bedingungen für stark ansteigendes Marktwachstum. Das Aufkommen des Dominanten Designs ist entscheidend für die Entwicklung der Industrie, die Unsicherheit auf Seiten der Konsumenten und Produzenten wird entscheidend reduziert und es lassen sich Mengen- und Skaleneffekte realisieren. Infolgedessen steigt das Marktvolumen stetig, wodurch Anreize für andere Firmen entstehen, in diesen Markt ein-

¹⁹ In der Abbildung wird das Industrielbenszykluskonzept im Zeitverlauf anhand des Marktvolumens dargestellt.

zutreten. Trotz eines starken Marktwachstums und vermehrter Markteintritte, kommt es auf der anderen Seite zu Marktsaustritten. Firmen, welche das sich formende Geschäftsmodell sowie das Dominante Design nur zu unwirtschaftlichen Kosten adaptieren können, verlassen den Markt frühzeitig.

- ▶ *Reifephase*: In dieser Phase verlangsamt sich das Marktwachstum entscheidend, da die Produkt- und Prozessinnovationen ihr Verbesserungspotential ausgeschöpft haben. Standardisierung sowie die Kodifizierung von ehemals implizitem Wissen fördert die vertikale Spezialisierung. Die Reifephase ist gekennzeichnet durch ein Abnehmen der Markteintritte. Die wenigen Neueintritte übernehmen Zulieferrollen oder fokussieren sich auf Marktnischen. Gleichzeitig forciert der sich intensivierende Wettbewerb den Marktaustritt von unproduktiven Wettbewerbern. Die überlebenden Unternehmen sehen sich einem profitablen Markt gegenüber, in dem sich die Marktanteile festgesetzt haben und vormals periphere Disziplinen wie Management, Produktion und Marketing an Relevanz gewinnen.
- ▶ *Niedergangsphase*: In der letzten Phase des Industrielbenszyklus sinkt das Marktvolumen dramatisch, der Markt schrumpft. Infolgedessen verschärft sich der Wettbewerb, die Margen werden geringer und viele Unternehmen verlassen den Markt.

Diese Phasen sowie deren Ausprägungen konnten in einer Vielzahl von Studien empirisch nachgewiesen werden.²⁰

2.4 Ableitung der Hypothesen

Der vorliegende Beitrag analysiert insbesondere die Frage, welche Akteure für die Entwicklung der technologischen Wissensbasis im Verlauf des Industrielbenszyklus relevant sind. Im Mittelpunkt der Untersuchung steht eine Branche, deren Entwicklung maßgeblich durch die Entwicklung einer oder weniger Schlüsseltechnologien getrieben wird: die Solarbranche. Mit anderen Worten: Im hier untersuchten Fall kann der Industrielbenszyklus mit Hilfe von Technologielebenszyklen abgebildet werden. Die betreffenden Schlüsseltechnologien finden fokussierte Anwendung in der betreffenden Industrie und sind nicht generischen Charakters.

Über die Identifikation der Branchenein- und ggf. –austrittszeitpunkte der Akteure, sollen in einem ersten Schritt zwei konkrete Forschungsfragen im Zusammenhang mit Industrie- und Technologielebenszyklen behandelt werden:

- (a) Welche Akteursgruppen dominieren die verschiedenen Phasen des Industrielbenszyklus? D.h. welche Rolle spielen die verschiedenen Akteure bei der Entwicklung neuer Technologien über die Zeit?

²⁰ Vgl. Liu et al. (2011); Keppler (1997), Audretsch/Feldman (1996).

In der Literatur zum Industrielbenszyklus wird davon ausgegangen, dass zu Beginn des Lebenszyklus Produktinnovationen dominieren, während später Prozessinnovationen eine größere Rolle spielen. Vor allem die ersten Produktinnovationen einer Branche beruhen oft auf sogenannten "radikalen" Innovationen. Es ist bekannt, dass etablierte, große Firmen in der Regel Schwierigkeiten haben, solche Innovationen durchzuführen.²¹ Folglich ist in der Einführungsphase mit einer großen Zahl von Neugründungen zu rechnen.

Sobald ein Dominantes Design entstanden ist, also die Wachstumsphase beginnt, kann dieses imitiert werden. Da gleichzeitig die Unsicherheit am Markt abnimmt, wird dieser auch attraktiver für große, etablierte Firmen. In der Wachstumsphase sollte also die Bedeutung von Neugründungen abnehmen und diversifizierende und imitierende Unternehmen sollten eine größere Bedeutung gewinnen. In der Reifephase nehmen die Markteintritte dann insgesamt stark ab und etablierte Unternehmen dominieren den Markt. Daraus ergibt sich folgende Hypothese:

Hypothese 1: In den frühen Phasen des Industrielbenszyklus dominieren zuerst Neugründungen die technologische Innovationstätigkeit. Im weiteren Verlauf nimmt die Relevanz von Neugründungen ab und die Rolle von Diversifizierern und Imitatoren nimmt zu. Das Ende der Wachstumsphase ist durch einen starken Rückgang der Markteintritte gekennzeichnet.

(b) Aus Unternehmenssicht ergibt sich die Frage: Spielt der Eintrittszeitpunkt in ein neues Technologiefeld eine Rolle für den Erfolg? Über die Ein- und Austrittszeitpunkte lässt sich die Überlebenswahrscheinlichkeit der verschiedenen Akteure nach Phasen differenziert identifizieren. Der ökonomischen Literatur zufolge sind Neugründungen in fortgeschrittenen Lebenszyklusphasen aufgrund der i.d.R. geringen Unternehmensgröße und dem geringen Erfahrung- und Branchenwissen gegenüber schon etablierten Wettbewerbern mit einem höheren Scheitungsrisiko behaftet.²² Fraglich ist, ob dieser Zusammenhang auch in der Solarbranche nachweisbar ist. Die für die Branche charakteristischen nationalen, regionalen und kommunalen Fördergelder der öffentlichen Hand senken das wahrgenommene Risiko der Marktbearbeitung. Darauf aufbauend folgt Hypothese 2:

Hypothese 2: Die Überlebenswahrscheinlichkeit von Neugründungen in späten Phasen ist geringer als in frühen Phasen. Entgegen üblicher Lebenszyklusbetrachtungen ist die Überlebenswahrscheinlichkeit von Neugründungen in der ganz frühen und üblicherweise mit großen Unsicherheiten behafteten Phase aufgrund der intensiven, öffentlichen Förderung hoch.

²¹ Vgl. Agarwal/Audretsch (2001).

²² Vgl. Agarwal/Audretsch (2001).

3 Methodisches Vorgehen

3.1 Identifikation der relevanten Unternehmen

Wie oben beschrieben, liegt der Untersuchungsgegenstand dieser Arbeit im Schnittfeld zwischen Technologielebenszyklus und Industrielbenszyklus. Dies erschwert die Identifikation der relevanten Akteure, welche sowohl markt- als auch technologieeitig bestimmt werden können. Um einen einheitlichen Datensatz zu erhalten, wird die Identifikation aus einer rein technologieorientierten Perspektive heraus vorgenommen. Die relevanten Akteure sind alle Unternehmen, die im entsprechenden Technologiefeld patentieren. Eine solche Vorgehensweise schließt zwar viele Akteure, die in der Solarbranche (jedoch nicht im relevanten Technologiefeld) aktiv sind, aus der Untersuchung aus, führt allerdings zu einer klaren objektiven Abgrenzung.

Es bleibt jedoch die Problematik, wie die relevanten Patentaktivitäten geeignet identifiziert werden können. Eine approximative Lösung dieser Problematik bietet die Technologieklassifikation nach Ulrich Schmoch (ISI-OST-INPI-Klassifikation), welche u.a. von der World Intellectual Property Organization (WIPO) für vergleichende Länderstudien hinsichtlich technologischer Entwicklungen verwendet wird.²³ Das ISI-OST-INPI-Schema überführt IPC-Patentklassen in Technologieklassen. Entsprechend der aktuellen Version (Stand August 2011) können alle verfügbaren Patentklassen sechs Technologieklassen mit insgesamt 39 Technologieunterklassen eindeutig zugeordnet werden. Im Rahmen dieser Untersuchung fanden alle Patente Berücksichtigung, die in Patentklassen angemeldet wurden, welche entsprechend der ISI-OST-INPI-Klassifikation in die Technologieunterklasse „solar energy“ in der Technologieklasse „energy technology“ fallen.

Ausgehend von der ISI-OST-INPI-Klassifikation wurde als Methode zur Identifikation der relevanten Unternehmen eine Patentabfrage vorgenommen. Als Datenquelle wurde hierbei auf die Patentdaten des Europäischen Patentamtes (EPO) zurückgegriffen.

In einem ersten Schritt wurde die Patentabfrage ausschließlich auf deutsche Patentanmeldungen sowie Akteure aus Deutschland beschränkt. Hierdurch konnte eine zielführende Eingrenzung auf die nationale Solarbranche vorgenommen werden. Dies trägt der Tatsache Rechnung, dass ein spezifischer Industrie- und Technologielebenszyklus in verschiedenen Ländern unterschiedlich weit fortgeschritten sein kann. Insbesondere in jungen Branchen, wie der Solarindustrie, die durch noch nicht ausgereifte Technologien gekennzeichnet sind, ist dies eher der Regelfall, als die Ausnahme. Desweiteren machen staatliche Subventionen diese Eingrenzung erforderlich. Die Branchen der Erneuerbaren Energien zählen weltweit zu

²³ Vgl. Schmoch (2008).

den stark subventionierten Branchen, sowohl auf der Abnehmerseite (Fördermittel für Erzeugung von Strom aus Erneuerbaren Energien), als auch auf der Anbieterseite (Fördermittel für F&E und Innovation).²⁴ In der Ausgestaltung der Fördermodelle und der Subventionszahlungen bestehen zum Teil erhebliche Unterschiede zwischen einzelnen Ländern.²⁵ Daraus resultieren differente Anreizstrukturen auf Anbieter- und Abnehmerseite, was sich in einer unterschiedlichen, nationalen Branchen- und Technologieentwicklung niederschlägt.

Es wurden daher alle Unternehmen mit Stammsitz in Deutschland ermittelt, die seit ihrer Gründung ein oder mehrere Patent(e) in Patentklassen angemeldet haben, welche entsprechend der ISI-OST-INPI-Klassifikation Solartechnologiefeldern zugeordnet werden.²⁶ Um eine eindeutige und korrekte Berücksichtigung aller Akteure zu gewährleisten, fanden desweiteren nur Patente Berücksichtigung, in deren Abstract das Wort „Solar“ enthalten ist.²⁷ Diese Eingrenzung trägt der in der Literatur vertretenen Auffassung Rechnung, dass das Abstract die wichtigste Quelle bei der Stichwortrecherche darstellt.²⁸ Die so erzielte Abgrenzung der Solartechnologiefelder ermöglicht u.a. die Identifikation der Lebenszyklusphasen auf der Basis von Patentierungskennzahlen.

Unter Ausselektion von Privatpersonen konnten durch die Patentabfrage 223 relevante Unternehmen ermittelt werden. Für diese wurden in einem nächsten Schritt die Gründungsjahre sowie die für die Untersuchung wesentlichen Veränderungen, wie z.B. Rechtsformwechsel, M&A's sowie Insolvenzen identifiziert. Hierbei wurde über die Firmenprofile der Anbieter Bürgel, Hoppenstedt und Creditreform, sowie auf Handelsregister- und Bundesanzeigerveröffentlichungen zurückgegriffen. Unternehmen, für die keine oder nur widersprüchliche Daten verfügbar waren, wurden für die weitere Untersuchung ausgeschlossen. Für jedes der verbleibenden Unternehmen wurde anschließend ein Patentprofil erstellt. Dieses Patentprofil umfasst alle angemeldeten Patente der jeweiligen Unternehmen seit der Gründung bis zum Jahr 2010, unabhängig von ihrem territorialen Schutzbereich. Als Datenquelle wurden auch hier die Patentdaten des EPO genutzt. Entsprechend der ISI-OST-INPI-Klassifikation wurden die Patentprofile in Technologieprofile überführt, um Aussagen über unternehmensspezifische Veränderungen in den technologischen Kompetenzen der Unter-

²⁴ Vgl. BMU (2010).

²⁵ Vgl. Schaller (2006), S. 114ff.

²⁶ Eine Übersicht über diese Patentklassen befindet sich im Anhang.

²⁷ Ein ähnliches Vorgehen findet sich bspw. bei Tseng et al. (2009) sowie bei Haupt et al. (2007b). Letztgenannte Autoren identifizieren das Technologiefeld „Herzschrittmacher“ über die Patentklassen derjenigen U.S.-Amerikanischen Patentanmeldungen, deren Abstract das Wort „pacemaker“ enthält. Sie verweisen darüber hinaus auf eine Vielzahl von Expertenmeinungen, nach denen sich ein Technologiefeld über einzelne Schlüsselbegriffe nahezu vollständig erfassen lässt.

²⁸ Vgl. Schmoch, U. (1990), S. 133.

nehmen treffen zu können. Nach einer Bereinigung des Datensatzes um widersprüchliche Angaben verblieben 138 Unternehmen für die weitere Untersuchung.

3.2 Arten und Herkunft der Unternehmen

Für die weitere Untersuchung ist es wichtig, die Unternehmen entsprechend ihrer Herkunft zu klassifizieren. Dazu werden zunächst zwei grundlegende Akteursgruppen unterschieden und diese Klassen anschließend weiter in Unterklassen ausdifferenziert.

3.2.1 Newcomer

In diese Gruppe fallen alle Unternehmen, die originär in der Solarbranche gegründet wurden. Der Gruppe der Newcomer werden diejenigen Akteure zugeordnet, deren erste Patentanmeldung im jeweiligen Patentportfolio in ein Solar-Schlüsseltechnologiefeld fällt. In einem darauf aufbauenden Schritt wird durch den Abgleich mit dem Gründungsdatum eine weitere Ausdifferenzierung vorgenommen. Es lassen sich zwei Untergruppen abgrenzen:

- a. Unternehmen werden als **Neugründung** deklariert, wenn das erste Patent seit der Gründung (= Patent in einem Solar-Schlüsseltechnologiefeld) nicht später als 5 Jahre nach der Gründung angemeldet wird. In diese Kategorie fallen somit auch Ausgründungen aus etablierten Unternehmen, sofern im Zuge der Ausgründung ein rechtlich und wirtschaftlich unabhängiges Unternehmen entsteht.
- b. Die Residualgröße wird als **neu innovierende Unternehmen** definiert. Hierein fallen Unternehmen, deren erste Patentanmeldung im gesamten Patentportfolio in einem Solar-Schlüsseltechnologiefeld erfolgt, wenn die Anmeldung mehr als 5 Jahren nach der Unternehmensgründung vorgenommen wird. Diese Untergruppe umfasst:
 - (b1) Unternehmen, die zwischen ihrer Gründung und der Anmeldung des ersten Patentes als Imitator ohne eigene Innovationstätigkeit in der Solarbranche oder anderen Branchen aktiv waren;
 - (b2) Unternehmen, die zwischen ihrer Gründung und der Anmeldung des ersten Patentes als Dienstleister in der Branche aktiv waren und erst nach mehr als 5 Jahren ihr Aktivitätsspektrum um technologische Innovation erweitern, sowie
 - (b3) Unternehmen, die seit der Gründung bereits in der Solarbranche mit technologischen Innovationen aktiv waren, zum Schutz der technischen Erfindungen jedoch bisher nicht auf Patente, sondern auf andere Strategien, insb. Geheimhaltung, gesetzt haben.

3.2.2 Diversifizierer

In die Gruppe der Diversifizierer fallen diejenigen Unternehmen, die bereits vor Anmeldung des ersten Patentes in einem Solar-Schlüsseltechnologiefeld oder in anderen Technologiefeldern mit entsprechender Patentaktivität innovativ aktiv waren. Das historische Patentportfolio kann anhand der IPC- Klassen, die den einzelnen Patenten zugeordnet sind, in Technologiefelder bzw. -bereiche entsprechend der ISI-OST-INPI Klassifikation überführt werden. Das Ausmaß der technologischen Aktivitäten in bestimmten Technologiebereichen kann so im Zeitverlauf abgebildet werden. Für jedes Unternehmen des Samples sind ab der Gründung dynamische Technologieprofile nachzeichnenbar. In dieser Akteursgruppe werden folglich alle Unternehmen zusammengefasst, die originär in einem anderem Technologie- oder Branchenumfeld aktiv waren und in Solartechnologien bzw. in die Solarbranche diversifiziert haben.

Vier Untergruppen lassen sich für Diversifizierer unterscheiden:

- a. Diversifikation von Unternehmen, die bislang in der Solarbranche aktiv waren, deren Innovationen jedoch nicht in den Schlüsseltechnologiefeldern, sondern in peripheren Solartechnologiebereichen angesiedelt waren.
- b. Technologiebasierte Diversifikation: Unternehmen, die bislang in an die Solartechnologie angrenzenden Technologiebereichen patentiert bzw. innoviert haben, erschließen sich i.S. einer klassischen, technologiebasierten Diversifikation neue Geschäftsfelder in der Solarbranche. Bsp. für verwandte Technologiefelder sind Halbleiter, Mikro-Systemtechnik und Silicium (Werkstofftechnologien).
- c. Unverbundene technologische Diversifikation: Unternehmen, die bisher in anderen Industriebereichen agieren, deren Technologien keine Verbindung zu Solartechnologien aufweisen, diversifizieren sich in Solartechnologien und die Solarbranche. Unter diese Kategorie der unverbundenen technologischen Diversifikation (streng genommen auch unter die Kategorie b) fallen auch jene Unternehmen, die den Markteintritt in die Solarbranche über Akquisitionen bestehender Akteure realisiert haben, sofern sie nach der Akquisition selbstständig technologisch innovieren.
- d. Diversifikation wissensintensiver Dienstleister in die Solartechnologie: Unternehmen, die bislang als wissensintensiver Dienstleister (bspw. Ingenieurbüros oder Projektentwickler) agierten, erschließen sich die Schlüsseltechnologiefelder in der Solarbranche (mit entsprechender Patentierungsaktivität).

3.2.3 Entwicklungsszenarien

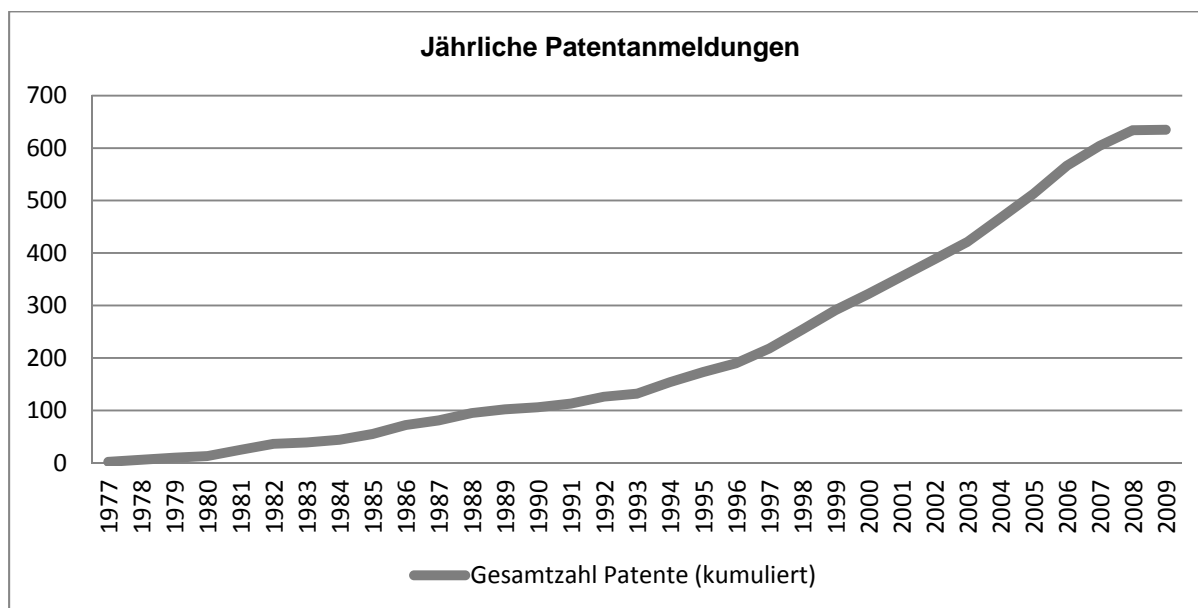
Die oben beschriebenen Akteursgruppen können generell unterschiedliche Verläufe in ihrer Unternehmensentwicklung aufweisen. Folgende drei Szenarien sind denkbar:

- a. *Noch aktive Unternehmen*: Unternehmen sind seit ihrer Gründung noch wirtschaftlich aktiv. Diese Gruppe umfasst sowohl Unternehmen, die in der Solartechnologie noch aktiv Forschung und Entwicklung betreiben, als auch Unternehmen, die im Technologiefeld Solar keine Innovationsaktivitäten mehr tätigen.
- b. *Endgültig gescheiterte Unternehmen (Insolvenz)*: Unternehmen melden nach technologischer Innovationstätigkeit in den betreffenden Schlüsseltechnologiefeldern der Solarbranche Insolvenz an und verlassen die Branche (Exit).
- c. *Akquirierte oder fusionierte Unternehmen*: Unternehmen werden nach eigenständiger technologischer Innovationstätigkeit in den betreffenden Schlüsseltechnologiefeldern der Solarbranche von anderen Unternehmen akquiriert oder fusionieren mit Wettbewerbern.

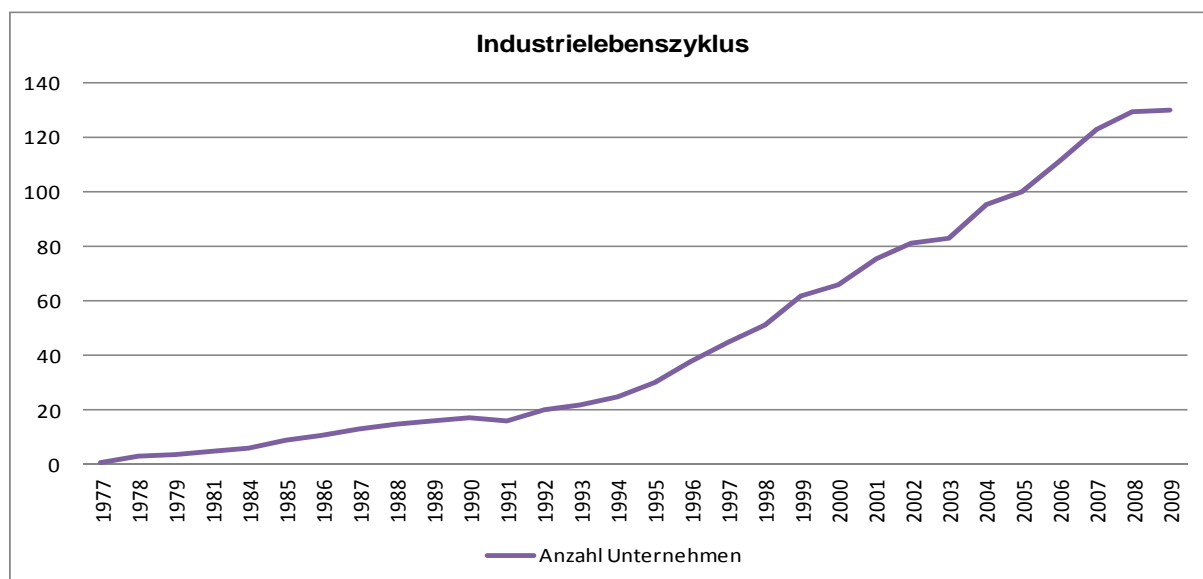
4 Ergebnisse

4.1 Grundlegende Ergebnisse

Der Technologielebenszyklus kann durch die kumulierten Patentanmeldungen in den Solar-Schlüsseltechnologiefeldern abgebildet werden. Somit finden, über alle Akteursgruppen hinweg, die jährlichen Patentanmeldungen im Technologiefeld Solar Berücksichtigung. Abbildung 2 stellt den Technologielebenszyklus im Technologiefeld Solar graphisch dar. Es ist ersichtlich, dass er dem in der Literatur vorherrschenden, idealtypischen Verlauf folgt.

Abb. 2: Technologielebenszyklus im Technologiefeld Solar

Aufbauend auf dem Technologielebenszyklus, lässt sich, wie bereits diskutiert, der Industrielbenszyklus der Solarbranche abbilden. Dies ist insbesondere deshalb möglich, da es sich bei Solartechnologien um nicht-generische Technologien handelt, welche eine fokussierte Anwendung in der betreffenden Branche finden. Der Industrielbenszyklus wird im Folgenden anhand der kumulierten Markteintritte und –austritte abgebildet. Als Eintrittszeitpunkt eines Unternehmens wird das Jahr definiert, in dem die Erschließung des Technologiefeldes Solar erfolgt ist. Die Austrittsjahre entsprechen den Insolvenz- bzw. Übernahme- oder Fusionszeitpunkten der betreffenden Unternehmen. Abbildung 3 gibt den Industrielbenszyklus der Solarbranche wieder. Entsprechend der theoretischen Implikationen in der Industrielbenszyklusliteratur ist auch dieser durch einen idealtypischen Verlauf charakterisiert.

Abb. 3: Industrielbenszyklus der Solarbranche

4.2 Herkunft der Akteure

Entsprechend der Klassifikation aus Kapitel 3.3 lassen sich alle 138 identifizierten Unternehmen in die entsprechenden Gruppen einordnen. Das Ergebnis aus Tabelle 4 zeigt, dass die aus den konzeptionellen Überlegungen abgeleiteten Gruppen empirisch nachgewiesen werden können. Die Mehrzahl der Unternehmen, die in die Solar-Schlüsseltechnologiefelder eintreten, erschließen diese durch verbundene oder unverbundene Diversifikation ihrer angestammten, technologischen Kompetenzen (55,8 Prozent).

Tabelle 4: Verteilung der Unternehmen auf die Akteursgruppen

Gruppe	Absolute Häufigkeit	Relative Häufigkeit
Neugründung	44	31,9%
Neu innovierend	17	12,3%
Diversifizierer	77	55,8%

Dieses Ergebnis wird durch bisherige Erkenntnisse aus der Diversifikationsforschung gestützt. Hier wird von einem kausalen Zusammenhang zwischen Risikosenkung und Diversifikationsgrad ausgegangen. Ein breit diversifiziertes Produkt- bzw. Technologieportfolio reduziert das unternehmensspezifische Risiko, indem dieses auf eine größere Anzahl von Aktivitäten gestreut wird.²⁹ Die Ressourcen und Kompetenzen des Unternehmens bleiben bei einer Diversifikation im Gegensatz zu einer originären, innovativen Neugründung nicht ausschließlich auf das Technologie- und Geschäftsfeld Solar beschränkt, sondern können darüber hinaus auch weiterhin in den angestammten (verwandten oder unverwandten) Ge-

²⁹ Vgl. Stephan (2003), S. 81, Amit/Livant (1998), Montgomery/ Singh (1984).

schäftsfeldern eingesetzt werden. In der Solarbranche stellen insbesondere die Forschungs- und Kapitalintensivität hohe Markteintrittskosten i.S. von irreversiblen Kosten dar. Das Markteintrittsrisiko für innovative Neugründungen mit technologischem Fokus auf Solartechnologien ist dementsprechend höher als für diversifizierende Unternehmen mit gestreuten technologischen und/oder marktlichen Aktivitäten.

Die seltenste Eintrittsstrategie in die Solartechnologie ist die verspätete Aufnahme von Innovations- bzw. Patentierungsaktivitäten mit 12,3 Prozent. Insbesondere in technologieintensiven Branchen, wie der Solarindustrie, werden Unternehmen i.d.R. versuchen, vornehmlich über patenrechtlich geschützte Innovationen in den Markt zu gelangen. Die vermeintlich originären Imitatoren, Geheimhalter, aber auch Dienstleister, sind in der Minderzahl, da sich die Akteure der Branche im Wesentlichen über Innovationen und Technologieführerschaft definieren.

In Hypothese 1 wurde die zeitliche Veränderung der Anteile von Neugründungen, Imitatoren und Diversifizierern an den relevanten Akteuren thematisiert. Demnach sollte die Relevanz von Neugründungen im Verlauf des Technologielebenszyklus abnehmen, während die Rolle von Diversifizierern und Imitatoren zunimmt. Tabelle 5 zeigt die Veränderung der Herkunft der Akteure in Abhängigkeit vom Zeitpunkt des Eintritts in das Technologiefeld Solar. Hypothese 1 wird nur zum Teil durch diese Daten bestätigt. Grundsätzlich ist zu erkennen, dass ab 1995 die technologischen Eintritte stark zunehmen und bis zum Ende des Beobachtungszeitraums keine Abnahme erfolgt. Daraus kann geschlossen werden, dass die Wachstumsphase der Branche um 1995 herum beginnt und bisher nicht beendet ist.

Entsprechend Hypothese 1 spielen Imitatoren in der Einführungsphase (vor 1995) kaum eine Rolle. Neugründungen besitzen jedoch nicht die erwartete maßgebliche Bedeutung, vielmehr dominieren diversifizierte Unternehmen die Technologieentwicklung in der Einführungsphase. Die Dominanz der Diversifizierer nimmt anschließend entgegen unserer Vermutungen in der Wachstumsphase ab, während die Bedeutung der Gruppe der neu innovierenden Unternehmen, die auch die Imitatoren enthält, in dieser Phase zunimmt. Auch der Anteil der Neugründungen nimmt im Widerspruch zu Hypothese 1 in dieser Phase leicht zu. Dies liegt womöglich daran, dass für die Kommerzialisierung und Marktdurchsetzung neuer Produkte in der Solartechnologie auch komplementäre Technologien, insbesondere aus den Gebieten der Elektrotechnik sowie des Anlagen- und Maschinenbaus, erforderlich sind. Aus diesen Branchen stammen auch die meisten Diversifizierer in der untersuchten Stichprobe. Das Beherrschen dieser komplementären Technologien erleichtert ganz offensichtlich den Markteintritt.

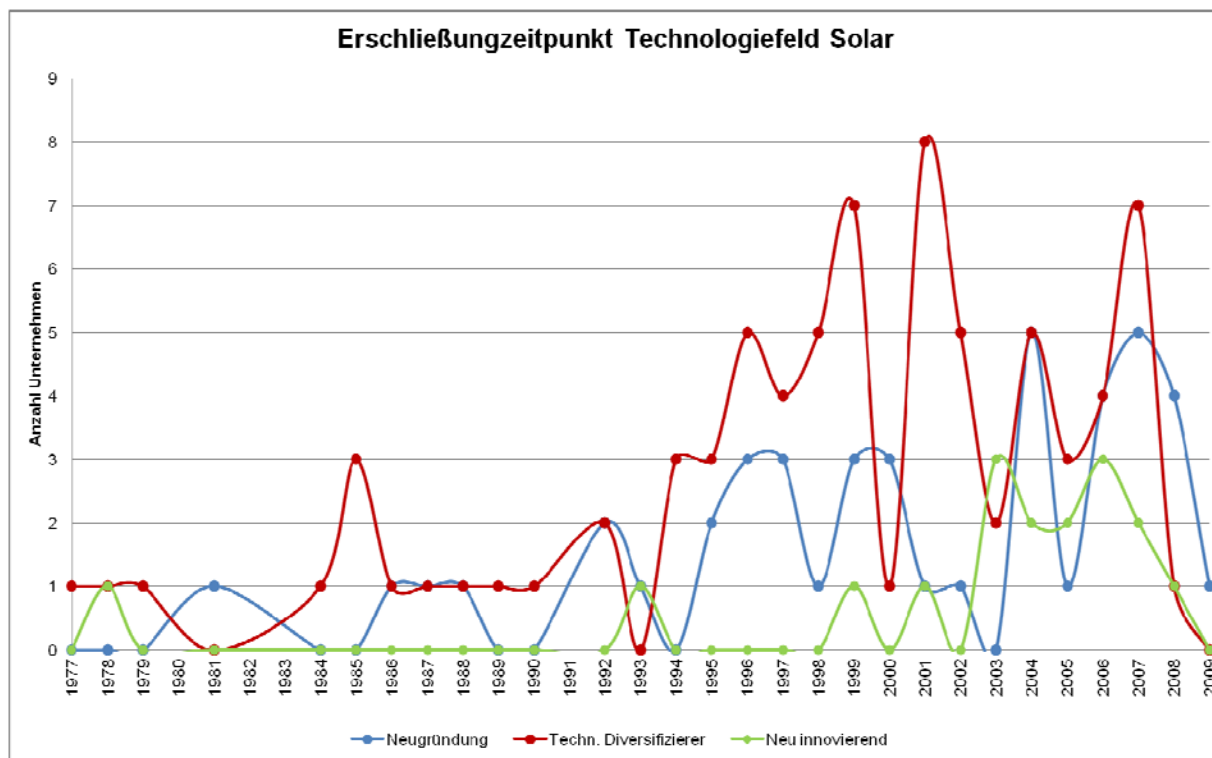
Tabelle 5: Zeitpunkt der Erschließung von Solar-Schlüsseltechnologiefeldern der Akteure

Technologieeintritt	Neugründung	Neu Innovierend	Diversifizierer
Vor 1985	1 (17%)	1 (17%)	4 (66%)
1985-1989	3 (30%)	0 (0%)	7 (70%)
1990-1994	3 (30%)	1 (10%)	6 (60%)
1995-1999	12 (32%)	1 (3%)	24 (65%)
2000-2004	10 (27%)	6 (16%)	21 (57%)
2005-2009	15 (39,5%)	8 (21%)	15 (39,5%)
Gesamtergebnis	44 (32%)	17 (12%)	77 (56%)

Eine andere mögliche Erklärung für die von den Hypothesen abweichenden Beobachtungen könnte auf die staatlichen Subventionen bzw. der Forschungsförderung für Erneuerbare Energien zurückzuführen sein. Das bereits angesprochene Risiko des Markteintritts in die forschungs- und kapitalintensive Solarbranche wird durch Subventionen erheblich gesenkt. Das finanzielle Risiko irreversibler Markterschließungskosten ist nicht mehr vollständig vom Unternehmensgründer zu tragen. Zudem wirken die nachfrageseitigen Subventionen wie eine Art „Absatzversicherung“. In Konsequenz steigen die Anreize zu einer innovativen Neugründung. Dies gilt insbesondere auch für die späteren Lebenszyklusphasen, in denen der Wettbewerb schon intensiviert ist und Marktanteile unter den etablierten Unternehmen zunehmend gefestigt sind. Eine weitere Ursache für die zunehmende Relevanz der Neugründungen im zeitlichen Verlauf des Industrielbenszyklus könnte darin liegen, dass in der Akteursuntergruppe „Neugründungen“ nicht zwischen klassischen Neugründungen und Spin-Offs, d.h. rechtlich und wirtschaftlich selbständigen Ausgründungen aus etablierten Unternehmen, differenziert wird. Für Folgeuntersuchungen wäre es daher interessant, die Bedeutung von Spin-Offs und klassischen Neugründungen in den Phasen des Industrielbenszyklus differenziert zu betrachten.

Abbildung 4 gibt die Erschließungszeitpunkte des Technologiefeldes Solar für die jeweiligen Akteursgruppen graphisch wider. Es ist erkennbar, dass die drei Akteursgruppen ähnlichen Schwankungsrichtungen unterliegen. Die Ursachen hierfür lassen sich aus dem Datenmaterial nicht ohne weiteres ableiten, hier besteht weiterer Forschungsbedarf.

Abb. 4: Jahre der Technologieerschließung



4.3 Erfolg der Unternehmen

Um den Lebenszyklus einer Industrie korrekt abzubilden, müssen neben Markteintritten u.a. auch die Marktaustritte Berücksichtigung finden. Durch den Vergleich der Markteintrittszeitpunkte mit den Marktaustrittszeitpunkten lassen sich Aussagen zur (gruppenspezifischen) Überlebensdauer sowie zur Überlebens- bzw. Scheiterungswahrscheinlichkeit gewinnen. Für das Untersuchungssample ergibt sich in der Solarbranche über alle Akteursgruppen hinweg eine allgemeine Scheiterungswahrscheinlichkeit von 8,7 Prozent. Um vertiefende Erkenntnisse zum Verlauf des Industrielbenszyklus sowie der Rolle der einzelnen Akteure zu gewinnen, lassen sich für die Hauptgruppen „Newcomer“ und „Diversifizierer“ die zwei Entwicklungsszenarien Marktaustritt (gescheitert) und noch im Markt aktiv (noch aktiv) differenzieren. Diese Analyse ist in Tabelle 6 abgetragen.

Tabelle 6: Scheiterungsfälle nach Akteursgruppen

Akteure	Anzahl	Gruppenanteil	Gesamtanteil
Neugründung	44		31,88%
gescheitert	7	16%	5,07%
noch aktiv	37	84%	26,81%
Neu innovierend	17		
noch aktiv	17	100%	12,32%
Diversifizierer	77		55,8%
gescheitert	5	6,5%	3,62%
noch aktiv	72	93,5%	52,18%
Gesamtergebnis	138		100%

In der Untergruppe der neu innovierenden Unternehmen lässt sich kein Scheiterungsfall nachweisen. Einschränkend ist hier jedoch anzumerken, dass es sich mit 17 Unternehmen um eine auffällig kleine Untergruppe handelt und diese Akteure im Schnitt später als andere Akteure in die Technologie eingetreten sind. Die Scheiterungswahrscheinlichkeit ist dementsprechend mit Vorsicht zu interpretieren bzw. nur bedingt mit den anderen Akteursgruppen vergleichbar. Bei den Neugründungen liegt die gruppenspezifische Überlebenswahrscheinlichkeit bei 84 Prozent, für die Diversifizierer ist diese mit 93,5 Prozent leicht höher. Dieses Ergebnis ist kohärent mit den bereits diskutierten Erkenntnissen der Lebenszyklus- und Diversifikationsforschung.

In Hypothese 2 wurde die Erfolgswahrscheinlichkeit einzelner Akteursgruppen während der verschiedenen Phasen des Industrielbenszyklus thematisiert. Es wurde die These aufgestellt, dass die Scheiterungswahrscheinlichkeit von Neugründungen in sehr frühen Lebenszyklusphasen, entgegen üblicher Lebenszyklusbetrachtungen, aufgrund der intensiven, öffentlichen Förderung eher gering ist.

Für den Betrachtungszeitraum der Untersuchung lässt sich kein klares Scheiterungsmuster im Verlauf des Industrielbenszyklus erkennen. Marktaustritte sind, wie bereits in Kapitel 4.2 ausgeführt, in den Akteursgruppen der technologischen Diversifizierer sowie der Neugründungen vertreten. Tabelle 7 differenziert die Scheiterungsjahre für die einzelnen Akteursgruppen weiter aus.

Tabelle 7: Anzahl der Scheiterungen

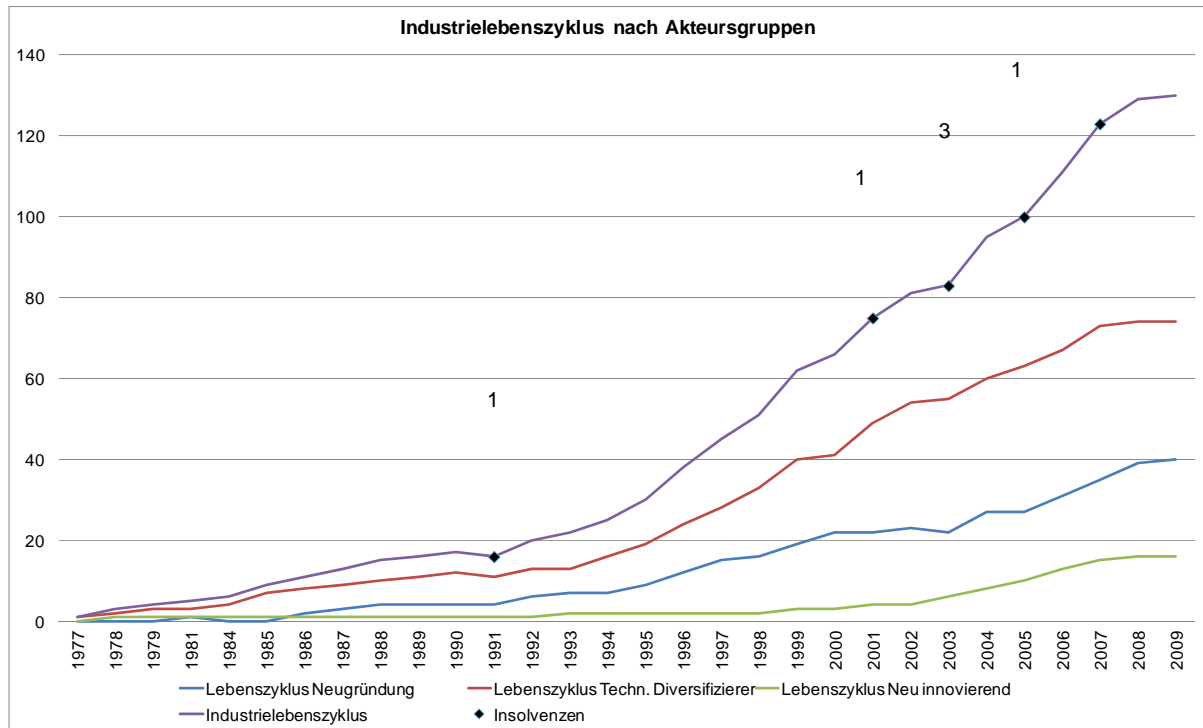
	1991	2001	2003	2005	2007	2010	2011
Jahr der Scheiterung							
Techn. Diversifizierer	1		2		1		1
Neugründung		1	1	1	1	2	1
Anzahl Scheiterungen	1	1	3	1	2	2	2

Die detaillierte Analyse nach dem Scheiterungsjahr lässt keine eindeutigen Aussagen zur gruppenspezifischen Veränderung der Scheiterungswahrscheinlichkeit in verschiedenen Lebenszyklusphasen zu. Die Anzahl der Marktaustritte verzeichnet über alle Gruppen hinweg einen tendenziell leichten Anstieg. Auffällig ist jedoch, dass, entsprechend der Hypothese 2, das Scheiterungsrisiko von Neugründungen in den frühen Phasen nicht eindeutig höher ist, als in späteren Phasen des Industrielbenszyklus. Vielmehr scheinen Neugründungen in frühen Phasen erfolgreicher zu sein, als in späteren Lebenszyklusphasen. So erfolgt ausschließlich ein Marktaustritt von Neugründungen, die ab dem Jahr 1995 stattgefunden haben (vgl. Tabelle 5, die erste Neugründung der untersuchten Unternehmen erfolgte vor 1985). Desweiteren ist der erste Marktaustritt bei dieser Akteursgruppe im Jahr 2001, d.h. der Wachstumsphase des Industrielbenszyklus, zu verzeichnen. Bei den gescheiterten Neugründungen ist zudem bemerkenswert, dass scheinbar diejenigen Unternehmen, die relativ früh gegründet wurden, eine relative längere Überlebensdauer aufweisen. Tabelle 8 gibt die Überlebensdauer nach Scheiterungsjahr wider.

Tabelle 8: Überlebensdauer der Neugründungen

Scheiterungsjahr	2001	2003	2005	2007	2010	2010	2011
Gründungsjahr	1996	1995	1999	2005	1997	2006	1992
Überlebensdauer in Jahren	5	8	6	2	13	4	19

In Abbildung 5 wird der Industrielbenszyklus differenziert nach den unterschiedlichen Akteursgruppen abgebildet. Es wird ersichtlich, dass die einzelnen Gruppen einem ähnlichen Verlauf folgen. Besonders deutlich wird in dieser Abbildung, dass es erst in späten Phasen des Industrielbenszyklus zu vermehrten Marktaustritten kommt. Die Zahlenwerte entlang des kumulierten Industrielbenszyklus geben die Gesamtzahl der Marktaustritte über alle Unternehmensgruppen hinweg für das entsprechende Jahr wider.

Abb. 5: Industrielbenszyklen aufgeschlüsselt nach den unterschiedlichen Akteursgruppen

5 Diskussion der Ergebnisse

Grundannahme der Lebenszykluskonzepte ist die Unterteilung in organischen Prozessen ähnelnde, evolutorische Entwicklungsphasen. In der ökonomischen Literatur wurden diese Konzepte u.a. zur Analyse von Industrien sowie Technologien aufgenommen und konnten in unterschiedlichen Studien wiederholt empirisch nachgewiesen werden. Auch in dieser Studie, mit dem Fokus auf der deutschen Solarbranche, konnten die in der Forschungsliteratur implizierten Verläufe des Technologie- und Industrielbenszykluskonzept bestätigt werden. Bei der Untersuchung der Lebenszyklen wurde berücksichtigt, dass die Entwicklung der technologischen Wissensbasis in den Schlüsseltechnologiefeldern von verschiedenen Unternehmenstypen determiniert wird. Der vorliegende Beitrag bietet eine erste Klassifizierung der beteiligten Akteure und analysiert deren Relevanz in den verschiedenen Phasen des Technologie- und Industrielbenszyklus.

Desweiteren konnte empirisch ermittelt werden, dass alle Akteursgruppen, über die verschiedenen Phasen des Industrielbenszyklus hinweg, einem ähnlichen Entwicklungsmuster folgen. Eine gruppenspezifische Dominanz in unterschiedlichen Lebenszyklusphasen kann nicht nachgewiesen werden. Hypothese 1 konnte daher nicht bestätigt werden. Entgegen der aus der Forschungsliteratur abgeleiteten Ausgangsvermutung, verlieren Neugründungen im Zeitverlauf nicht an Relevanz, sie nehmen sogar zu. Mögliche Ursachen hierfür könnten in

den staatlichen Subventionen und Spin-off-Neugründungen liegen. Staatliche Subventionen senken marktseitig die Kosten des Markteintritts und wirken absatzseitig wie eine „Abnahmeversicherung“, unabhängig von der Lebenszyklusphase. Desweiteren wurde bei den Neugründungen keine Unterscheidung zwischen klassischen Neugründungen und Spin-Offs vorgenommen. Für Spin-off-Neugründungen sind jedoch die Markteintrittsrisiken und –kosten relativ geringer, da sie von sog. „Pre-entry-knowledge“ durch das Mutterunternehmen profitieren können. Die Annahmen des traditionellen Industrielbenszykluskonzeptes hinsichtlich des Markteintrittsverhaltens von Neugründungen ist auf die spezielle Gruppe der Spin-Offs nicht uneingeschränkt übertragbar. Hier bietet sich ein interessanter Anknüpfungspunkt für Folgeuntersuchungen.

Hypothese 2 konnte hingegen bestätigt werden. Das Scheitungsrisiko von Neugründungen ist in frühen Lebenszyklusphasen, entgegen klassischen Lebenszyklusbetrachtungen, nicht signifikant höher, als in späteren Phasen. Als mögliche Begründung hierfür wurden staatlichen Subventionen angeführt. Bemerkenswert ist in diesem Kontext die Beobachtung, dass bei Neugründungen im Falle des Scheiterns gerade diejenigen Unternehmen die höchste Überlebensdauer aufweisen, die in vergleichsweise frühen Jahren des Industrielbenszyklus gegründet wurden. Es scheint zu einer Art „verspäteter“ Insolvenz der Unternehmen zu kommen. Ausgehend von der Identifikation dieses Zusammenhangs, der in auffälliger Weise der vorherrschenden Literatur widerspricht, besteht jedoch weiterer Forschungsbedarf hinsichtlich spezifischer Determinanten sowie deren Einflussrichtung und -intensität.

Eine weitere Ursache für das relativ geringe Scheitungsrisiko von Neugründungen in den frühen Phasen des Industrielbenszyklus könnte ebenfalls darin liegen, dass in der Akteursgruppe „Neugründungen“ nicht zwischen klassischen Neugründungen und Spin-Offs, d.h. Ausgründungen aus etablierten Unternehmen, differenziert wird. Ausgegründete Unternehmen können i.d.R. trotz wirtschaftlicher und rechtlicher Selbständigkeit auf Teile der Ressourcenbasis und Kompetenzbasis des Mutterunternehmens zugreifen bzw. Teile dieser übernehmen.³⁰ Dieses „Pre-entry-Knowledge“, bleibt klassischen Neugründungen verwehrt, was u.a. zu einem vergleichsweise höheren Scheitungsrisiko führt. Aktuelle Entwicklungen, wie die Ausgründungen der etablierten Unternehmen Bosch mit Bosch Solar oder RWE mit RWE Innogy zeigen, dass Spin-Offs in der Solarbranche durchaus Relevanz besitzen. Mit steigendem Anteil der Spin-Offs im Untersuchungssample ist davon auszugehen, dass die Scheiterungswahrscheinlichkeit für die Gesamtgruppe der Neugründungen geringer ausfällt.

³⁰ Vgl. Hinterhuber et al. (2007), S.173.

6 Ausblick

Die vorliegende Untersuchung dient einem ersten Verständnis der Entwicklung der technologischen Wissensbasis in den Schlüsseltechnologiefeldern der Solarindustrie. Es konnten wesentliche Akteursgruppen definiert und ihre Relevanz in verschiedenen Phasen des Industrielebenszyklus analysiert werden. Der Beitrag liefert somit eine wichtige Grundlage für das Verständnis möglicher Entwicklungsdynamiken in technologiegetriebenen Branchen. Dennoch ergeben sich Limitationen der Untersuchung und Anknüpfungspunkte für weitere Forschungsfragen.

Die zwei Akteursgruppen (Newcomer und Diversifizierer) wurden zwar theoretisch in weitere Untergruppen ausdifferenziert, i.R. der empirischen Analyse fanden jedoch nur die Hauptgruppen Beachtung. Besonders deutlich wird dies bei den Newcomern. Wie mehrfach erwähnt, wurde hier keine Unterscheidung zwischen klassischen Neugründungen und Spin-Offs vorgenommen, was zu sehr groben Aussagen führt. Gleiches gilt für die Diversifizierer, für die keine detailliertere, gruppenspezifische Unterscheidung in verschiedene Diversifikationsarten vorgenommen wurde. Eine Ausdifferenzierung innerhalb dieser spezifischen Akteursgruppe würde vertiefende Erkenntnisse ermöglichen. Allerdings ist in diesem Kontext auf die äußerst schlechte Datenverfügbarkeit, insb. zu Ausgründungsaktivitäten, hinzuweisen. Einen Anhaltspunkt könnten Geschäftsberichte oder die Recherche auf der Internetpräsenz der betreffenden Unternehmen liefern. Hier besteht jedoch die Problematik, dass es sich bei den Unternehmen des Samples um i.d.R. kleine, nicht offenlegungspflichtige Unternehmen handelt, die zudem teilweise über keinen Internetauftritt verfügen.

Auch die relativ kleine Untergruppe der als „neu innovierend“ deklarierten Unternehmen könnte für zukünftige Untersuchungen weiter ausdifferenziert werden. Durch die unternehmensspezifische Erfassung der NACE-Zuordnung über den Industrielebenszyklus hinweg können ehemalige Dienstleister identifiziert und von vorher nicht patentaktiven Industrieunternehmen differenziert werden. Letztere Teilgruppe könnte durch die Analyse von Geschäftsberichten und Unternehmensveröffentlichungen weiter aufgegliedert werden in Imitatoren sowie Unternehmen mit technologischer Entwicklungstätigkeit in der Vergangenheit, aber ohne entsprechende Patentaktivität (z.B. Unternehmen, die auf Geheimhaltung statt Patentierung zum Schutz von Innovationen setzen). Auch hier besteht die Problematik der mangelnden Datenverfügbarkeit.

Eine Ausdifferenzierung der Akteursgruppe „Diversifizierer“ entsprechend der in Kapitel 3.3.2 vorgenommenen Klassifikation könnte vertiefende Erkenntnisse zum Verhalten und der Rolle verschiedener Diversifikationstypen im Verlauf des Industrielebenszyklus liefern. Interessant wäre in diesem Zusammenhang z.B. die Fragestellung, ob das Postulat der Diversifikations-

forschung, dass verbundene Diversifizierer eine höhere Erfolgswahrscheinlichkeit aufweisen, als unverbundene Diversifizierer, auch bei einer Diversifikation in das Technologiefeld Solar bzw. der Solarbranche nachgewiesen werden kann.

Ein höherer Differenzierungsbedarf ergibt sich auch bei den Marktaustritten. Eine Unterscheidung zwischen den Scheitungsursachen Insolvenz, Übernahme sowie Fusion würde eine genauere Analyse des Austrittsverhaltens für alle Akteursgruppen ermöglichen. Hierfür wäre eine Ergänzung des Datensatzes um Merger&Acquisition-Daten erforderlich.

Eine Erweiterung des Untersuchungsspektrums und möglicher Forschungsfragen ergibt sich durch eine ergänzende Klassifizierung der Akteure in Kleinstunternehmen, Kleine Unternehmen, Mittlere Unternehmen sowie Große Unternehmen entsprechend der Definition der Europäischen Kommission. Unterschiede innerhalb und zwischen den Akteursgruppen könnten so vor dem Hintergrund des Einflusses der Unternehmensgröße untersucht werden.

Einen weiteren Kritikpunkt stellt das Vorgehen bei der Identifikation der relevanten Akteure dar. Durch die kombinierte Patentabfrage aus den für die Untersuchung relevanten Patentklassen und dem Schlagwort Solar wird implizit eine, d.h. „die Solar-Schlüsseltechnologie“ unterstellt. Für weitere Untersuchungen wäre es daher sinnvoll, Schlagwörter für einzelne Solartechnologien, aber auch für angrenzende und periphere Technologiebereiche, wie z.B. „silicium“ oder „wafer“, zu definieren. Zudem ist anzumerken, dass durch die Beschränkung der Schlagwortsuche auf den Begriff „solar“ im Abstract diejenigen Patente nicht berücksichtigt werden, bei denen kein Abstract hinterlegt ist. Daraus kann sich die Problematik ergeben, dass z.B. der Technologieerschließungszeitpunkt falsch erfasst wird oder vereinzelt relevante Unternehmen keinen Eingang in die Untersuchung finden.

Zudem wurde die hohe Relevanz der Subventionen der öffentlichen Hand in der Solarbranche in den Ergebnissen mehrfach deutlich. Diese scheinen einen nicht unerheblichen Einfluss auf die Entwicklung der technologischen Wissensbasis in der Solarindustrie zu haben. Der Staat fördert das Entstehen neuer Technologien sowohl direkt über Innovationsförderung für Unternehmen als auch indirekt durch die öffentliche Forschung. Damit stellt sich für zukünftige Untersuchungen die Frage, welche Effekte diese beiden Maßnahmen auf das Entstehen neuer Technologien haben. Aus einer geographischen Perspektive könnte dies Einfluss auf die spätere, geographische Verteilung der Akteure haben. Hierbei wird in der Literatur davon ausgegangen, dass neue Technologien konzentriert an bestimmten Orten entstehen und sich die räumliche Verteilung im Verlauf des Industrielebenszyklus in der Regel verfestigt. Damit stellt sich allgemein die Frage, welche Faktoren das räumliche Muster der Technologieentstehung determinieren.

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Anhang

Patentklassifikationen nach Schmoch:

IPC neu	E04D	E04D	F03G	F24J	F03G	F24J	F24J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	E04D 1/30;	E04D 13/18	F03G 6/06	F24J 2/00;	F24J 2/02;	F24J 2/04;	F24J 2/05

IPC neu	F24J	F24J	F24J	F24J	F24J	F24J	F24J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	F24J 2/06	F24J 2/07	F24J 2/08	F24J 2/10	F24J 2/12	F24J 2/13	F24J 2/14

IPC neu	F24J	F24J	F24J	F24J	F24J	F24J	F24J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	F24J 2/06	F24J 2/07	F24J 2/08	F24J 2/10	F24J 2/12	F24J 2/13	F24J 2/14

IPC neu	F24J	F24J	F24J	F24J	F24J	F24J	F24J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	F24J 2/06	F24J 2/07	F24J 2/08	F24J 2/10	F24J 2/12	F24J 2/13	F24J 2/14

IPC neu	F24J	F24J	F24J	F24J	F24J	F24J	F24J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	F24J 2/06	F24J 2/07	F24J 2/08	F24J 2/10	F24J 2/12	F24J 2/13	F24J 2/14

IPC neu	F24J	F24J	F24J	F24J	F24J	F24J	F24J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	F24J 2/15	F24J 2/16	F24J 2/18	F24J 2/23	F24J 2/24	F24J 2/36	F24J 2/38

IPC neu	F24J	F24J	G02B	G02F	G05F	H01L	H01L
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	F24J 2/42	F24J 2/46	G02B 5/10	G02F 1/136	G05F 1/67	H01L 25/00	H01L 31/00

IPC neu	H01L	H01L	H01L	H01L	H01L	H01L	H02J
Sector	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology	Energy technology
Field	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy	Solar energy
IPC	H01L 31/04	H01L 31/042	H01L 31/048	H01L 31/052	H01L 31/18	H01L 33/00	H02J 7/35

Essay VII:

Die Glaubwürdigkeit der Innovationskommunikation - Eine empirische Analyse des Kommunikationsverhaltens von deutschen Unternehmen

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Status: *Eingereicht bei der zfbf im Mai 2013, abgelehnt mit Review, überarbeitet, momentaner Status daher Arbeitspapier.*

Die Glaubwürdigkeit der Innovationskommunikation - Eine empirische Analyse des Kommunikationsverhaltens von deutschen Unternehmen

Zusammenfassung

Der vorliegende Beitrag untersucht empirisch, in welchem Umfang Unternehmen, über die Publizitätspflicht hinaus, ihre F&E- und Innovationstätigkeit in der externen Rechnungslegung kommunizieren. Die Innovationskommunikation wird im Rahmen einer quantitativen Inhaltsanalyse der Geschäftsberichte von 22 deutschen Unternehmen aus den Branchen Automobilhersteller und Zulieferer, Chemie und Produktionstechnik im Zeitraum von 2003-2007 erfasst. Im vorliegenden Papier werden, mithilfe einer kombinatorischen Methodik, unterschiedliche Kommunikationsmuster im Sinne von Innovationskommunikationstypen identifiziert. Diese werden hinsichtlich ihrer Glaubwürdigkeit, im Sinne einer Übereinstimmung von Aussage und Tatsache, gegliedert. In diesem Rahmen wurde empirisch ermittelt, wie viel die Unternehmen in F&E investieren, wie viele Patente diese anmelden und wie dies entsprechend in den Geschäftsberichten kommuniziert wird. Es wird nachgewiesen, dass einige Unternehmen ihre Investitionen und Erfolge in F&E nicht adäquat kommunizieren, teilweise sogar *schön* reden. Darüber hinaus wird anhand eines fixed-effects Modells überprüft, inwiefern die Glaubwürdigkeit der Innovationskommunikation Auswirkungen auf die Bewertung am Kapitalmarkt nach sich zieht. Hier konnten keine signifikanten Ergebnisse festgestellt werden; (nicht-) glaubwürdige Kommunikation wird vom Kapitalmarkt nicht (negativ) positiv bewertet.

JEL-Classification: M41, G14 , O32

Keywords: Innovationskommunikation · Value Reporting · Forschung & Entwicklung · Patente · Glaubwürdigkeit

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Die Glaubwürdigkeit der Innovationskommunikation - Eine empirische Analyse des Kommunikationsverhaltens von deutschen Unternehmen

1 Motivation

Innovationen sind in einem hochgradig dynamischen Umfeld überlebenswichtig und gelten als ein Schlüssel für den Unternehmenserfolg.² Jedoch ist die alleinige Generierung von Innovation nicht ausreichend. Um eine Innovation zum Erfolg zu führen, bedarf es unter anderem kommunikativer Begleitung.³ Diese Kommunikation muss zielgerichtet an relevante Stakeholder, z. B. Kunden, Kreditgeber oder Finanzanalysten erfolgen. Doch nicht nur Produkte und Dienstleistungen erfordern eine pointierte Kommunikationsstrategie. Auch Unternehmen selbst versuchen, sich auf vielfältige Weise ein innovatives Image zu verleihen und sich als Innovator zu positionieren. Um tatsächlich innovativ zu sein, bedarf es jedoch mehr als der reinen Außendarstellung.

Der vorliegende Beitrag adressiert die Frage, ob und wie Unternehmen ihre tatsächlich durchgeführten Innovationsaktivitäten in Geschäftsberichten kommunizieren. Erfolgt die Berichterstattung dieser Aktivitäten transparent und wahrheitsgemäß? Entspricht die Kommunikation der Innovationsaktivitäten den Tatsachen, d. h. wie glaubwürdig sind die Kommunikationsbemühungen? In welchem Verhältnis stehen bspw. die Ausgaben für Forschung & Entwicklung (im folgenden F&E) und die Kommunikation von Innovationen bzw. Innovationserfolgen? In welchem Verhältnis steht die technologische Kompetenz einer Unternehmung zur Berichterstattung über diese? In anderen Worten: Wie innovativ sind Unternehmen, die sich in ihren Geschäftsberichten selbst als innovativ bezeichnen, wirklich?

Das folgende Papier untersucht in einer Stichprobe mit 110 Beobachtungen von deutschen Unternehmen aus drei unterschiedlichen Branchen (Automobilhersteller und Zulieferer, Chemie, Produktionstechnik) im Zeitraum 2003-2007, in welchem Umfang

² Vgl. *Gerybadze* (2004), S. 6.

³ Vgl. *Zerfuß et al.* (2004), S. 56.

Unternehmen über die Publizitätspflicht hinausgehend, glaubwürdig über F&E und Innovation innerhalb ihres Geschäftsberichtes informieren.

2 Theoretischer Bezugsrahmen

2.1 Innovationsorientierung von Unternehmen

Als Wettbewerbsfaktoren von Unternehmen gelten heutzutage neben dem Humankapital vor allem die Informationserfassung und -verarbeitung sowie die Fähigkeit zu innovieren.⁴ Die Fähigkeit zu innovieren erfordert kontinuierliche Innovationsbemühungen, d. h. Investitionen in Innovation. Einen zentralen Bestandteil der Innovationsaktivitäten bilden Ausgaben für F&E. Die F&E deckt aber nur einen Teil der erforderlichen Bemühungen zur Einführung von Innovationen ab. Die Gesamtkosten für Innovationen liegen oft um den Faktor 2 bis 3 über den eigentlichen F&E-Kosten.⁵ F&E-Aktivitäten stehen in einem reziproken, jedoch kausal nicht bedingendem Verhältnis zur Innovation. Es ist aber davon auszugehen, dass zumindest im verarbeitenden Gewerbe ein enger Zusammenhang zwischen F&E-Aktivitäten und Innovationen besteht: Kontinuierliche F&E-Aktivität geht in der Regel mit einer Erhöhung der Innovationsleistung der Unternehmen einher.⁶

Trotz beständiger Betonung der Bedeutsamkeit von F&E und Innovation finden sich in der Literatur keine eindeutigen empirischen Ergebnisse, in welchem Ausmaß F&E bzw. Innovationen den Unternehmenserfolg beeinflussen. So zeigen *Song et al.* (2008), dass F&E keinen Einfluss auf den nachhaltigen Erfolg technologiegetriebener Unternehmen hat.⁷ *Rubera/Kirca* (2012) weisen hingegen nach, dass die Innovationsorientierung von Unternehmen eine positive Erfolgswirkung nach sich zieht.⁸ *Gerpott* (2005) fasst in einer Metaanalyse zusammen, dass zwar statistisch signifikante positive Korrelationen zwischen F&E-Intensität und Erfolgskriterien von Unternehmen bestehen, jedoch sei die Stärke dieses Zusammenhanges praktisch bedeutungslos.⁹ Auch wenn die Stärke bzw. das Ausmaß des Zusammenhangs zwischen Innovationsorientierung und Unternehmenserfolg noch nicht vollständig determiniert sind, so herrscht in der

⁴ Vgl. *Epstein/Jermakowic* (2008), S. 292.

⁵ Vgl. *Gerybadze* (2004), S. 6.

⁶ Vgl. *EFI* (2012), S. 132.

⁷ Vgl. *Song* (2008), S. 9.

⁸ Vgl. *Rubera/Kirca* (2012), S. 139.

⁹ Vgl. *Gerpott* (2005), S. 2.

Literatur dennoch Einigkeit darüber, dass F&E und Innovationen die Basis für den zukünftigen Erfolg einer Unternehmung darstellen.¹⁰

Ein möglicher Grund für die fehlende empirische Fundierung der Erfolgswirkung von F&E- und Innovationsaktivitäten insbesondere am Kapitalmarkt könnte daran liegen, dass das vorhandene Innovationspotential einer Unternehmung nicht ausreichend kommuniziert wird. Hierdurch kann es zu einer Unterbewertung der Unternehmen am Kapitalmarkt kommen.¹¹ Die Notwendigkeit zur Innovationskommunikation durch F&E betreibende Unternehmen begründet sich darüber hinaus auch durch den Zusammenhang zwischen hohen F&E-Intensitäten und der Volatilität der daraus resultierenden Erträge. Ursachen hierfür sind der unsichere Erfolg unerprobter Technologien, weit in der Zukunft liegende Rückzahlungsperioden sowie sich verkürzende Produktlebenszyklen, welche zukünftige Cash-Flows gefährden.¹² Die Fähigkeit, das Innovationspotential einer Unternehmung akkurat zu kommunizieren, erfährt folglich eine übergeordnete Bedeutung.¹³ Allerdings finden sich bis dato für deutsche Unternehmen keine empirischen Studien, die sich hiermit eingehend beschäftigen.

2.2 Innovationskommunikation

Die Kommunikation der Innovationsorientierung bzw. innovativer Aktivitäten an externe Stakeholder als Teilbereich bzw. Subkategorie der Unternehmenskommunikation verdeutlicht und sichert das Zukunftspotential des Unternehmens. *Zerfaß et al.* (2004) definieren Innovationskommunikation als: „*die systematisch geplante, durchgeführte und evaluierte Kommunikation von Innovationen mit dem Ziel, Verständnis für und Vertrauen in die Innovation zu schaffen sowie die dahinter stehende Organisation als Innovator zu positionieren.*“¹⁴ Aus dieser Definition leiten sich mehrere konkrete Zielsetzungen ab: Die Innovationskommunikation schafft bzw. stärkt das Vertrauen der Stakeholder in die technologische Stärke und das Innovationspotential eines Unternehmens.¹⁵ Innovationskommunikation in Verbindung mit erfolgreichen Innovationsbemühungen bildet so Reputation, z. B. als Technologie-

¹⁰ Vgl. *EFI* (2012), S. 20ff.

¹¹ Vgl. *Ballardini et al.* (2005), S. 4.

¹² Vgl. *Chan/Lakonishok/Sougiannis* (2001), S. 2431f.; *Meek/Roberts/Gray* (1995), S. 555; *Aboody/Lev* (2000), S. 2747.

¹³ Vgl. *Zerfaß/Huck* (2007), S. 851.

¹⁴ *Zerfaß et al.* (2004), S.56.

¹⁵ Vgl. *Mast et al.* (2006), S. 128.

führer. Reputation schafft Kundenbindung und dient der Gewinnung neuer Kunden.¹⁶ Gleichzeitig erleichtert eine entsprechende Reputation den Umgang mit Konkurrenten, Lieferanten und anderen Kooperationspartnern. Die Reputation als Technologie- und Innovationsführer hilft zudem Kapital- bzw. Aktiengesellschaften, neue institutionelle oder private Anleger zu gewinnen oder vorhandene Anleger stärker an das Unternehmen zu binden.¹⁷ Dies hat ein höheres Kursniveau zur Folge und führt über die Verbreiterung des Aktionärskreises zugleich zu einer Stabilisierung des Aktienkurses (bzw. dessen Wachstumsrate) auf hohem Niveau.

Gegenstand bzw. Inhalt der Innovationskommunikation können innovationsbezogene Inputleistungen – bspw. Zahl der F&E-Mitarbeiter oder Höhe der Innovationsaufwendungen – und auch outputbezogene Ergebnisse der Innovationsaktivitäten – bspw. neue Produkte, der Umsatzanteil mit Innovationen oder Patente – sein. So stellt bspw. die Kommunikation der Patentqualität in technologieintensiven, innovativen Unternehmen eine wichtige Funktion der Public Relations (PR/Öffentlichkeitsarbeit) und in Aktiengesellschaften zudem eine zentrale Funktion der Investor Relations dar.

2.3 Glaubwürdigkeit der Kommunikation

In der Theorie des kommunikativen Handelns nach *Habermas* (1981) fungiert Kommunikation als soziales Handeln, er verbindet damit die Kommunikationstheorie mit einer Sozial- und Gesellschaftstheorie. *Habermas* (1981) unterscheidet strategisches, d. h. erfolgsorientiertes und verständigungsorientiertes Handeln.¹⁸ Strategische Kommunikation ist intentional und auf die Durchsetzung eigener Interessen fixiert, verständigungsorientierte Kommunikation erfolgt vorbehaltlos. Die Kommunikationsbemühungen eines Unternehmens an externe Stakeholder lassen sich im Sinne von *Habermas* dem strategischen Handeln zuordnen.¹⁹ Der Kommunikation liegt eine erfolgsorientierte Einstellung zugrunde, sie ist auf die Durchsetzung eigener Interessen fixiert. Unternehmen versuchen durch Kommunikation ihre gesteckten Ziele zu erreichen, sei es bspw. die Positionierung des Unternehmens als Ganzes oder die

¹⁶ Vgl. *Bruhn/Homburg* (2005), S. 8.

¹⁷ Vgl. *Burr et al.* (2006), S. 348.

¹⁸ Vgl. *Habermas* (1981), S. 8ff.

¹⁹ Vgl. *Picot et al.* (2003), S. 87.

Anpreisung von neuartigen Produkten oder Dienstleistungen.²⁰ Das Gelingen der Kommunikationsbemühungen ist nach *Habermas* (1981) an verschiedene Geltungsansprüche gebunden, unter anderem an die Wahrheit der kommunizierten Aussagen und an die Wahrhaftigkeit bzw. Glaubwürdigkeit, ohne die die Kommunikationspartner kein Vertrauen entwickeln können.²¹

Glaubwürdigkeit und Vertrauen werden in der Literatur unterschiedlich behandelt. Teilweise werden beide synonym, teilweise zusammenhängend aber als getrennte Konstrukte und teilweise als vollkommen unabhängige Konstrukte behandelt.²² Es bestehen aber ganz offenbar wechselseitige Kausalitäten zwischen beiden Konstrukten: Glaubwürdigkeit der Kommunikation ist sowohl Voraussetzung als auch Ergebnis von Vertrauen. Andererseits muss Vertrauen für viele Aspekte der Kommunikation bereits vorhanden sein, um überhaupt als glaubwürdig wahrgenommen zu werden.²³ *Derieht* (1995) beschreibt das Verhältnis von Glaubwürdigkeit zu Vertrauenswürdigkeit als untrennbare symbiotische Beziehung²⁴. Glaubwürdigkeit und Vertrauen werden dennoch unterschiedliche Attribute zugeschrieben. *Eisend* (2003) identifiziert drei Merkmale, um diese Unterschiede zu verdeutlichen: Erstens haben die Begriffe einen unterschiedlichen Zeitbezug. Glaubwürdigkeit stelle ein Beurteilungskriterium mit Gegenwartsbezug dar, während Vertrauen, trotz seines ebenfalls vorhandenen Gegenwartsbezug stets auch auf die Zukunft gerichtet sei. Zweitens unterscheiden sich die beiden Begriffe durch die Auswahl der Bezugsobjekte. Glaubwürdigkeit beziehe sich ausschließlich auf Kommunikation und deren Quellen. Vertrauen hingegen inkludiere ein weites Spektrum an Bezugsobjekten wie bspw. soziale Strukturen, Organisationen oder technische Aspekte. Drittens liegen verschiedene Merkmalseigenschaften vor: Vertrauen wird als Einstellung oder konkretes Verhalten definiert, während Glaubwürdigkeit eine Eigenschaft darstelle.²⁵ Darüber hinaus werden Vertrauen und Glaubwürdigkeit durch verwandte Phänomene wie Authentizität, Ehrlichkeit, Transparenz, Kompetenz, oder Verständlichkeit manifestiert bzw. verstärkt.²⁶ *Hubig/Simoneit* (2007) unterscheiden schließlich zwischen Schein und Sein von Vertrauen und Glaubwürdigkeit: (a) vertrauens- und glaubwürdig zu *erscheinen* beinhaltet die aus strategisch-taktischen

²⁰ Vgl. *Zerfaß et al.* (2004), S. 2.

²¹ Vgl. *Hubig/Simoneit* (2007), S. 172.

²² Vgl. *Zerfaß/Huck* (2007), S. 849.

²³ Vgl. *Reinmuth* (2006), S. 197.

²⁴ Vgl. *Derieht* (1995), S.28ff.

²⁵ Vgl. *Eisend* (2003), S. 51.

²⁶ Vgl. *Reinmuth* (2006), S. 197.

Gründen inszenierte Vertrauens- und Glaubwürdigkeit, um selbstgesteckte Ziele zu erreichen; (b) vertrauens- und glaubwürdig zu *sein*, zielt dagegen auf transparente und ehrliche Kommunikation als Baustein einer langfristig angelegten Beziehungsbildung zwischen Unternehmen und externen Stakeholdern ab.²⁷ Um diese Konstrukte in einem wirtschaftswissenschaftlichen Kontext zu analysieren, ist es erforderlich, sie im Rahmen der Kommunikation von Unternehmen zu konkretisieren. Vertrauen(sbildung) ist ein langfristiger und kontinuierlicher Prozess, der immer wieder aufs Neue bestätigt werden muss. Als Bezugsobjekt wird Vertrauen meist Unternehmen oder Produkten bzw. Markennamen zugeschrieben. Glaubwürdigkeit kann sich hingegen zeitlich begrenzt in Werbemaßnahmen oder einem Kommunikationsinstrument wie bspw. einem Geschäftsbericht widerspiegeln.²⁸ Vertrauen und Glaubwürdigkeit beeinflussen darüber hinaus die Reputation eines Unternehmens und vice versa.²⁹

2.4 Unternehmenswertsteigerung durch Value Reporting

Die Innovationsfähigkeit eines Unternehmens basiert auf immateriellen Vermögenswerten und daran gekoppelten Wertschöpfungsprozessen, die sich nicht vollständig innerhalb des Zahlenwerkes des Jahresabschlusses abbilden lassen. Folglich hat die Bereitstellung von Informationen, die über die jährliche Berichtspflicht hinausgehen, an Bedeutung gewonnen.³⁰ Investor Relations Abteilungen zielen darauf ab, glaubwürdige Informationen zu veröffentlichen, um die bestehenden Informationsasymmetrien zu reduzieren, d.h. um somit eine faire Bewertung des Unternehmens zu erzielen.³¹ Folglich kann durch den Abbau von Informationsasymmetrien das endogene Risiko der Kapitalüberlassung reduziert werden.³²

Unvollständige Kommunikation, mangelnde Glaubwürdigkeit und die damit einhergehende fehlende Vermittlung von Authentizität und Transparenz der Unternehmen sanktioniert der Kapitalmarkt durch niedrigere Bewertungen und Kursabschläge (lack-of-transparency discounts), was sich negativ auf den Unternehmenserfolg bzw. die

²⁷ Vgl. *Hubig/Simoneit* (2007), S.171ff.

²⁸ Vgl. *Piwinger* (2007), S. 454.

²⁹ Vgl. *Ramaj* (2009), S. 44.

³⁰ Vgl. *Bukh et al.* (2005), S. 714.

³¹ Vgl. *Paul et al.* (2011), S. 751.

³² Vgl. *Börner et al.* (2010), S. 231.

Finanzierungskosten auswirkt.³³ Unternehmen versuchen diesem Mechanismus entgegenzuwirken, indem sie dem Kapitalmarkt über die formalen Verpflichtungen hinausgehende, zusätzliche Informationen im Geschäftsbericht zur Verfügung stellen, was als Voluntary Disclosure bezeichnet wird.³⁴ Die Deutsche Vereinigung für Finanzanalyse und Asset Management (DVFA), die Interessenvertretung von Analysten und Investoren, publiziert Standards für eine effektive Finanzkommunikation, die Marktteilnehmern als Handlungsempfehlungen für Unternehmen dienen sollen. Hier wird die Glaubwürdigkeit von Informationen sowie die damit einhergehende glaubwürdige Kommunikation als Oberziel der Investor Relations gesehen.³⁵ Gemäß den Empfehlungen sollen im Sinne einer wertorientierten Berichterstattung (Value Reporting) wertorientierte Handlungen nicht nur im Unternehmen umgesetzt, sondern auch entsprechend glaubwürdig kommuniziert werden, um die Lücke zwischen Buchwert und Shareholder Value zu schließen.³⁶ Dies soll durch den Abbau von Informationsasymmetrien und der daraus resultierenden Agency-Problematik zwischen potenziellen Investoren und Unternehmensführung erreicht werden.³⁷ *Ruhwedel/Schultze* (2002) definieren Value Reporting als: „die Bereitstellung verdichteter, über die Pflichtpublizität hinausgehender Informationen aus dem operativen und strategischen Bereich mit dem Ziel [...], die Unternehmensbewertung durch Unternehmensexterne zu erleichtern und damit eine eventuell vorhandene Wertlücke zwischen aktuellem Marktpreis und innerem Wert zu dezimieren.“³⁸

In Anlehnung an die unter 2.3 beschriebenen Geltungsansprüche der Kommunikation ist für die Kapitalmarktteilnehmer die Glaubwürdigkeit der wertorientierten Berichterstattung insofern relevant, als sie sich bei der Beschaffung und Bewertung von Informationen mit Unsicherheiten konfrontiert sehen. Werden Informationen offengelegt, die über die Publizitätspflicht hinausgehen, mangelt es oft an einer vergleichbaren Bewertungsgrundlage als Referenzgröße, weshalb die allgemeine Glaubwürdigkeit der Unternehmen hier als Informationssurrogat dienen kann.³⁹ Nach *Ramaj* (2009) ist Glaubwürdigkeit dann gegeben, wenn Kapitalmarktteilnehmer darauf vertrauen können, dass Aussagen über die Unternehmensereignisse adäquat beschrieben

³³ Vgl. *Yu* (2005), S.54f.

³⁴ Vgl. *Lammert* (2009), S. 1.

³⁵ Vgl. *DVFA* (2008), S. 2.

³⁶ Vgl. *Günther/Beyer* (2001), S. 1624.; *Labhart/Volkart* (2001), S. 116.

³⁷ Vgl. *Corsten/Lingau* (2004), S. 249

³⁸ *Ruhwedel/Schultze* (2002), S. 608.

³⁹ Vgl. *Hillmann* (2011), S. 51.

sind und folglich die kommunizierten Informationen ex post stimmig sind.⁴⁰ Auch bei der Offenlegung der Forschungs- und Entwicklungsaktivitäten müssen sich externe Stakeholder vielfach auf die Glaubwürdigkeit der dargelegten Informationen verlassen. Denn nach den Rechnungslegungsstandards wie HBG, US-GAAP oder IFRS bestehen bilanzpolitische Spielräume, die zu einer unterschiedlichen Bilanzierungspraxis hinsichtlich der F&E-Aktivitäten führen.⁴¹

3 Typologie zur Innovationskommunikation und Forschungsfragen

3.1 Erfassung der Innovationsorientierung

Um die Innovationsorientierung einer Unternehmung in angemessener Bandbreite zu erfassen und zu kommunizieren, müssen mehrere Indikatoren in Betracht gezogen werden. Der Grundstein für zukünftige Innovationen wird im verarbeitenden Gewerbe meist in den Forschungs- und Entwicklungsabteilungen der Unternehmen gelegt. Daher geben die Investitionen in F&E einen ersten Überblick über das Innovationspotential der Unternehmen. Weiterhin erscheint es für eine Evaluierung der Innovationsorientierung sinnvoll, abzuwägen, wie effektiv diese Investitionen sind. Erteilte Patente stellen einen objektiven und frei verfügbaren Maßstab dar, um diese Effektivität vergleichend beurteilen zu können. Trotz des Vorbehalts, dass nicht alle erteilten Patente in marktfähige neue Produkte oder Prozesse einfließen, ist zumindest ein Rückschluss auf die Produktivität der F&E-Tätigkeit zulässig.

Aus der Perspektive der Unternehmenskommunikation ergibt sich anschließend die Frage, in welchem Ausmaß bzw. in welcher Intensität die Investitionen in F&E und die Produktivität der Innovationsaktivitäten kommuniziert werden. In diesem Papier umfassen die Innovationsaktivitäten einer Unternehmung die Investitionen in F&E, die Produktivität der eingesetzten Mittel sowie die entsprechende Kommunikation der Investitionen und deren Produktivität.

⁴⁰ Vgl. *Ramaj* (2009), S. 44ff.

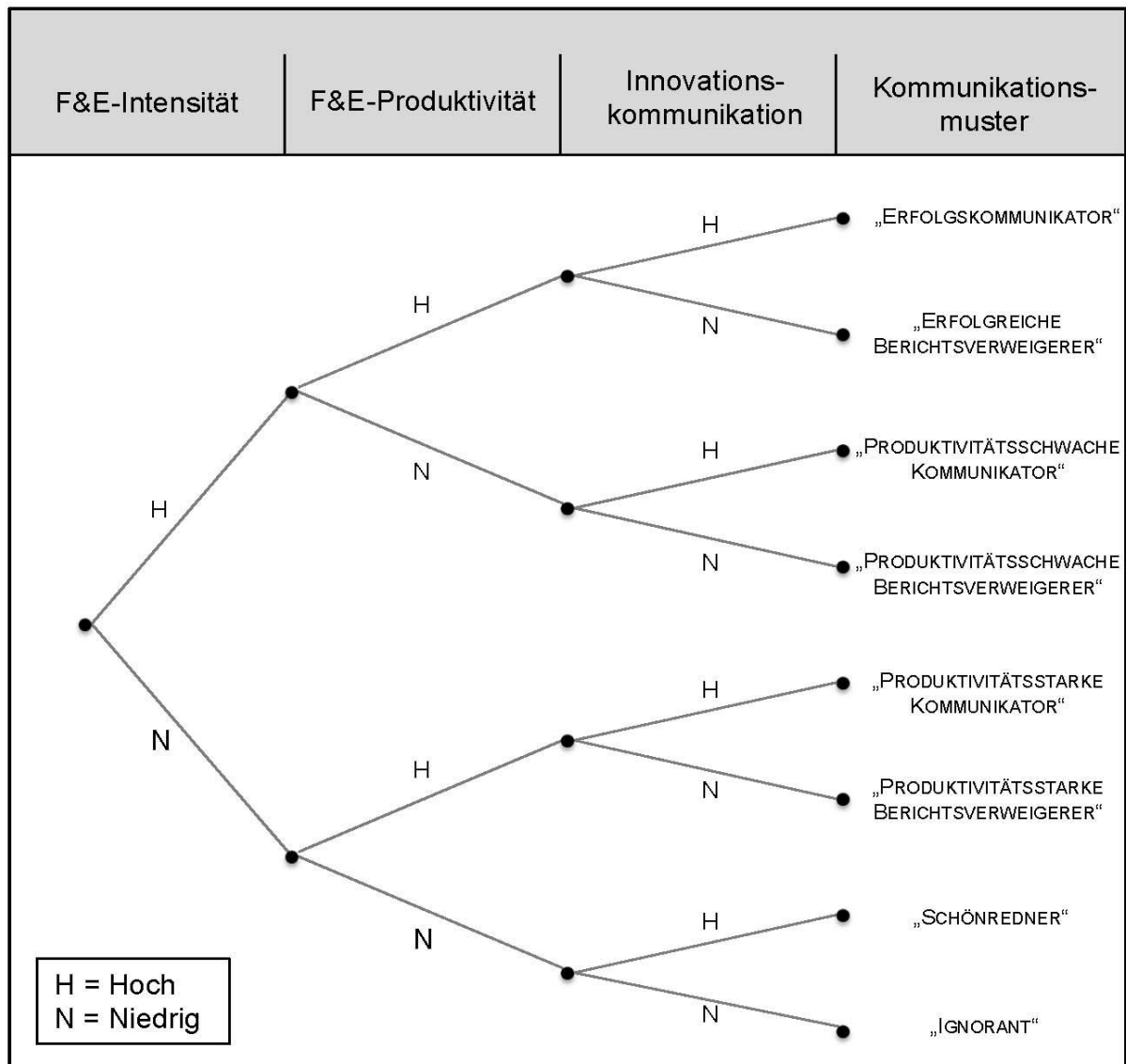
⁴¹ Vgl. *Hillmann* (2011), S. 53f.

3.2 Kombinatorische Herleitung und theoretische Beurteilung der Kommunikationsmuster

Durch die ganzheitliche Betrachtung der Innovationsaktivitäten von Unternehmen sollten sich Unterschiede in den Kommunikationsbemühungen aufzeigen lassen. Im Folgenden werden daher die Innovationsaktivitäten und die Berichterstattung, d. h. die externe Kommunikation über diese Aktivitäten einander gegenüber gestellt. Derart werden unterschiedliche Muster einer glaubwürdigen bzw. nicht-glaubwürdigen Innovationskommunikation identifiziert. Die jeweiligen Innovations- und Kommunikationsaktivitäten werden jeweils in Hoch/Niedrig Kategorien unterteilt, um so, einem kombinatorischen Grundgedanken entsprechend, unterschiedliche Kommunikationsmuster zu identifizieren. Es konnte nach eingehendem Literaturstudium kein geeignetes Rahmenkonzept identifiziert werden, bspw. zeigen *Newell/Goldsmith* (2001) eine Methodik zur Untersuchung der Glaubwürdigkeit von Unternehmen auf, diese stützt sich allerdings auf Befragungen und ist folglich nicht geeignet. Daher wird innerhalb dieses Papiers eine Methodik entwickelt, um Innovationsaktivitäten abzubilden und Aussagen über deren Glaubwürdigkeit zu treffen⁴². *Abbildung 1* fasst diesen Gedankengang zusammen und gibt einen ersten Überblick über die verschiedenen Kommunikationsmuster.

⁴² Vgl. *Newell/Goldsmith* (2001), S. 235ff.

Abb. 1: Kommunikationsmuster der Innovationskommunikation



Im Zuge dieser Typologisierung ergeben sich insgesamt acht Kommunikationsmuster mit unterschiedlichen Attributen, welche im Folgenden näher beschrieben werden:

- ▶ Der „Erfolgskommunikator“ ist durch eine relativ hohe F&E-Intensität und F&E-Produktivität bei gleichzeitig intensiver Innovationskommunikation gekennzeichnet.
- ▶ Der „erfolgreiche Berichtsverweigerer“ hingegen verzichtet auf eine intensive Innovationskommunikation, obwohl die Innovationsaktivitäten in beiden Dimensionen überdurchschnittlich hoch ausgeprägt sind.

- ▶ Der „produktivitätsschwache Kommunikator“ weist eine hohe F&E-Intensität, aber niedrige F&E-Produktivität auf; er kommuniziert seine Innovationsaktivitäten jedoch intensiv.
- ▶ Ähnlich zum Vorgängertyp weist der „produktivitätsschwache Berichtsverweigerer“ eine hohe F&E-Intensität, aber niedrige F&E-Produktivität auf; in Abgrenzung zum Vorgängertyp kommuniziert er seine Innovationsaktivitäten aber nicht intensiv.
- ▶ Das Kommunikationsmuster „produktivitätsstarker Kommunikator“ ist gekennzeichnet durch niedrige F&E-Intensität und hohe F&E-Produktivität bei stark ausgeprägter Innovationskommunikation.
- ▶ Der „produktivitätsstarke Berichtsverweigerer“ ist im Gegensatz zum Vorgänger durch niedrige F&E-Intensität, hohe F&E-Produktivität und schwach ausgeprägte Innovationskommunikation gekennzeichnet.
- ▶ Der „Schönredner“ kommuniziert seine Innovationsaktivitäten intensiv, weist jedoch eine niedrige F&E-Intensität und F&E-Produktivität auf.
- ▶ Der „Ignorant“ weist einheitlich niedrige Merkmalsausprägungen hinsichtlich der F&E-Intensität und -Produktivität sowie der Innovationskommunikation auf.

Wie anhand der *Abbildung 1* ersichtlich wird, unterscheiden sich die jeweiligen Kommunikationsmuster hinsichtlich ihrer Transparenz und Ehrlichkeit bei der Übermittlung von Informationen bezüglich ihrer Innovationsaktivitäten. Aus diesen theoretischen Überlegungen sollten sich somit Rückschlüsse auf die Glaubwürdigkeit der Innovationskommunikation ziehen lassen. Der „Erfolgskommunikator“ beinhaltet eine ehrliche und transparente Kommunikationspolitik, d. h. hohe Ausgaben für F&E bei einer hohen F&E-Produktivität werden intensiv kommuniziert. Folgerichtig kann diesem Kommunikationsmuster Glaubwürdigkeit unterstellt werden. Darüber hinaus werden die Kommunikationsmuster „produktivitätsschwache Berichtsverweigerer“, „produktivitätsstarke Kommunikator“ und „Ignorant“ als glaubwürdig eingestuft. Diese kommunizieren ehrlich und authentisch ihre Innovationsaktivitäten.

Der „erfolgreiche Berichtsverweigerer“ weist eine hohe F&E-Intensität und F&E-Produktivität auf, er kommuniziert diese Erfolge im Geschäftsbericht aber nicht entsprechend. Dieses Kommunikationsmuster ist daher im Sinne einer mangelhaften Transparenz als unglaubwürdig einzustufen. Weiterhin sind der „produktivitäts-

schwache Kommunikator“, der „produktivitätsstarke Berichtsverweigerer“ und der „Schönredner“ als unglaubwürdig einzustufen.

Allerdings erscheint das Maß der Glaubwürdigkeit an sich nicht ausreichend, um über die Kommunikationsbemühungen zu urteilen. Es sollte auch die Intention der Unternehmen berücksichtigt werden. Der „Schönredner“ ist im Sinne von *Hubig/Simoneit* (2007) ein aus strategisch-taktischen Gründen vorgebrachtes Kommunikationsverhalten von Unternehmen. Diese versuchen trotz niedriger Innovationsbemühungen und -erfolge ihr Unternehmen als innovativ sowie forschungs- und entwicklungsstark darzustellen, sprich die Innovationsaktivitäten *schön* zu reden. Diese unehrliche Kommunikation kann sich, gesetzt den Fall, dass die externen Stakeholder diesen Sachverhalt durchschauen, negativ auf die Glaubwürdigkeit von Unternehmen auswirken. Diesem strategisch-taktischen Handeln ist auch der „produktivitätsschwache Kommunikator“ zuzuordnen. Die Kommunikationsbemühungen des oben als unglaubwürdig angeführten Kommunikationsmusters „erfolgreiche Berichtsverweigerer“ und „produktivitätsstarke Berichtsverweigerer“ können jedoch nur bedingt dem strategisch-taktischen Verhalten einer Unternehmung zugeordnet werden. Hier werden entweder bewusst die Innovationsaktivitäten eines Unternehmens nicht angemessen kommuniziert, z. B. weil Tatbestände rund um das Thema F&E geheim gehalten werden sollen. Oder es werden unbewusst die vorhandenen Investitionen bzw. Erfolge der F&E nicht ausreichend kommuniziert, in diesem Falle könnte den Unternehmen mangelhafte Innovationskommunikation vorgeworfen werden.

3.3 Entwicklung der Forschungsfragen

In Anlehnung an die theoretischen Ausführungen sollten die Ausgaben für F&E, die u.a. für zukünftig zu erzielende Renditen stehen, im Sinne einer nachhaltigen und glaubwürdigen Unternehmenspolitik externen Stakeholdern im Geschäftsbericht transparent gemacht werden. Hieraus folgt Forschungsfrage 1:

Forschungsfrage 1a: Eine hohe F&E-Intensität geht einher mit häufiger Verwendung des Begriffs Innovation.

Forschungsfrage 1b: Eine hohe F&E-Intensität geht einher mit häufiger Verwendung des Begriffs F&E.

Die F&E-Produktivität sollte im Sinne der unter 2.4 beschriebenen Investor Relations-Funktion entsprechend kommuniziert werden, woraus Forschungsfrage 2 folgt:

Forschungsfrage 2a: Eine hohe F&E-Produktivität geht einher mit häufiger Verwendung des Begriffs Innovation.

Forschungsfrage 2b: Eine hohe F&E-Produktivität geht einher mit häufiger Verwendung des Begriffs F&E.

Es stellt sich außerdem die Frage, inwieweit externe Stakeholder die Innovationskommunikationsbemühungen der Unternehmen evaluieren bzw. durchschauen. Um diesen Sachverhalt zu überprüfen, sollen etwaige Auswirkungen am Kapitalmarkt nachvollzogen werden. Bezugnehmend auf Kapitel 2.3 werden die Kommunikationsmuster entsprechend ihrer Glaubwürdigkeit zusammengefasst, somit ergibt sich folgende Forschungsfrage 3:

Forschungsfrage 3a: Eine nicht glaubwürdige Kommunikation wird am Kapitalmarkt negativ, d. h. mit einem Discount bewertet.

Forschungsfrage 3b: Eine glaubwürdige Kommunikation wird am Kapitalmarkt positiv, d. h. mit einem Premium bewertet.

4 Forschungsmethodik

4.1 Stichprobe

Um Unternehmen mit hoher Innovationsorientierung zu identifizieren, wurden als primäre Maßgröße die Ausgaben für F&E betrachtet. Zu diesem Zweck wurden in einem ersten Schritt aus dem EU Industrial R&D Investment Scoreboard von 2003 (Beginn des Untersuchungszeitraumes) alle Unternehmen ausgewählt, die ihren Unternehmenssitz in Deutschland haben. Somit beschränkte sich das Sample zunächst auf exakt 100 Unternehmen. Darüber hinaus sollte eine Listung am Kapitalmarkt, Patentanmeldungen am DPMA und eine Branchenvergleichbarkeit gegeben sein. Außerdem mussten die Geschäftsberichte in digitalisierter Form und die Veröffentlichungsdaten dieser verfügbar sein. Letztendlich ergibt sich somit ein Sample von 22 Unternehmen mit 110 Beobachtungen in den Branchen Automobilhersteller und Zulieferer, Chemie und Produktionstechnik für den Zeitraum 2003-2007. Die Branchenklassifizierung richtet sich nach der Industry Classification Benchmark, an

dieser Stelle richtet sich die Klassifikation nach Sektoren. Die jeweiligen Sektoren sind 3350 (Automobilhersteller und Zulieferer), 1350 (Chemie) und 2750 (Produktionstechnik). Acht Unternehmen können der Branche der Automobilhersteller und Zulieferer zugerechnet werden und je sieben Unternehmen den Branchen Chemie und Produktionstechnik. Automobilhersteller und Zulieferer wie BMW, Volkswagen oder Continental befinden sich bspw. in der Stichprobe. Als Beispiele für die Chemie-Branche können Unternehmen wie BASF oder Bayer, für die Produktionstechnik Heidelberger Druckmaschinen, Gildemeister oder König & Bauer genannt werden. Der Untersuchungszeitraum von 2003 bis 2007 wurde bewusst gewählt, um einerseits Verzerrungen im Nachgang der Dotcom-Blase 2001/2002 und andererseits der Finanz- und Immobilienkrise 2008/2009 auszublenden.⁴³ Volkswirtschaftlich gesehen handelt es sich um erfolgreiche Jahre: Das Bruttoinlandsprodukt der Euro-Zone wuchs in den Jahren von 2003 bis 2007 um durchschnittlich 4,3%, das deutsche um 2,6% pro Jahr.⁴⁴

Zunächst wurde die F&E-Intensität der Unternehmen erfasst (Relation von Umsatz zu den Ausgaben für F&E). Trotz Vorbehalten gegenüber der F&E-Intensität als Innovationsindikator, wird dieser aufgrund seiner Simplität und breiten Verfügbarkeit in der Literatur als Gütekriterium verwendet.⁴⁵ Weiterhin wird die F&E-Produktivität der Unternehmen betrachtet. Diese ergibt sich aus der Relation zwischen F&E-Ausgaben und erteilten Patenten. Es gingen nur tatsächliche erteilte Patente in die Untersuchung mit ein, es wurde jedoch das Patentanmeldedatum berücksichtigt, um die Patente den jeweiligen Jahren zuzuordnen. Grundsätzlich geben Patente Auskunft über die technologische Leistungsfähigkeit bzw. Kompetenz einer Unternehmung und werden gemeinhin als Erfolgsindikator für das innovative Bemühen von Unternehmen betrachtet.⁴⁶ Da es sich um ein rein deutsches Sample handelt, wurden ausschließlich Patentanmeldungen am Deutschen Patent und Markenamt (DPMA) berücksichtigt. Die betrachteten Unternehmen meldeten im Untersuchungszeitraum gesamtheitlich 63.560 Patente am DPMA an.

⁴³ Vgl. *Michler/Smeets* (2011), S. 5.; *Wieandt/Moenninghoff* (2011), S. 509.

⁴⁴ Vgl. *OECD* (2012)

⁴⁵ Vgl. *Rammer* (2011), S. 20.

⁴⁶ Vgl. *Stephan* (2003), S. 141.

4.2 Quantitative Inhaltsanalyse

Um zu erfassen, inwiefern Unternehmen über ihre Innovationsaktivitäten berichten, sprich Innovationskommunikation betreiben, wurden die Geschäftsberichte der Unternehmen einer quantitativen Inhaltsanalyse mit der Software MAXQDA unterzogen. Als das zentrale Element der Berichterstattung in Deutschland gilt der Geschäftsbericht; dieser ist das strategische Kernstück der Unternehmenskommunikation und die Visitenkarte eines Unternehmens.⁴⁷ An keiner anderen Stelle wird so detailliert über die erbrachten und zukünftig zu erbringenden Leistungen einer Unternehmung berichtet. Neben der Vermittlung aktueller Finanzkennzahlen und der Erfüllung regulatorischer Publikationspflichten dient der Geschäftsbericht auch der Image- und Beziehungspflege mit zahlreichen Stakeholdern, wie privaten Investoren, Analysten, Journalisten oder Industriepartnern. Darüber hinaus soll er im besten Fall weiche Faktoren wie Authentizität, Seriosität und Originalität widerspiegeln.⁴⁸ Die Glaubwürdigkeit von Geschäftsberichten ist Gegenstand zahlreicher Untersuchungen, die Ergebnisse sowie Methoden variieren dabei stark.

Allgemein beschäftigt sich die Inhaltsanalyse mit der Analyse von Inhalten jedweder Form von Kommunikation.⁴⁹ Nach *Lamnek* (2010) ist die Inhaltsanalyse eine sozialwissenschaftliche Forschungstechnik zur objektiven und systematischen Deskription um manifesten Kommunikationsinhalt zu erfassen.⁵⁰ Die Inhaltsanalyse lässt sich qualitativ und quantitativ unterscheiden, wobei sich die quantitative Inhaltsanalyse nicht der Erfassung der vielschichtigen semantischen Komplexität eines gesamten Textes widmet, vielmehr werden hier wenige ausgewählte Merkmale desselben reduktiv analysiert.⁵¹ Dieser Methode liegt die Annahme zugrunde, dass die Häufigkeiten von Worten oder spezifischen Textbausteinen sowie deren Zusammensetzung ein wichtiger Indikator für die Identifikation der dahinter verborgenen Ereignisse und Zusammenhänge sind.⁵² Hierzu nähert sich die quantitative Inhaltsanalyse dem Textinhalt als systematisches, objektives Verfahren, welches sich intersubjektiv nachprüfen lässt. Die Ergebnisse von bisherigen Studien zeigen, dass die

⁴⁷ Vgl. *Baetge/Kirchhoff* (1997), S. 17.; *Meckel et al.* (2008), S. 1.

⁴⁸ Vgl. *Piwinger* (2007), S. 456.

⁴⁹ Vgl. *Mayring* (2008), S. 11

⁵⁰ Vgl. *Lamnek* (2010), S. 434ff.

⁵¹ Vgl. *Brosius et al.* (2009), S. 141.

⁵² Vgl. *Breton* (2009), S. 188.

quantitative Inhaltsanalyse für die Untersuchung der strategischen Ausrichtung von Unternehmen geeignet ist.⁵³

In dieser Untersuchung wurden die Geschäftsberichte auf Begrifflichkeiten hin untersucht, die im Folgenden unter dem lexikalischen Wortstamm Innovation und F&E subsumiert werden. Innovation sowie F&E werden an dieser Stelle als lexikalisches Morphem betrachtet. Somit werden Abwandlungen oder Abkürzungen wie beispielsweise Forschung und Entwicklung, FuE, F&E unter Forschung & Entwicklung zusammengefasst. Im Gegensatz zu den üblichen Kodierungen und Gruppierungen von Worten bzw. Textbausteinen in der qualitativen Inhaltsanalyse wird in dieser Untersuchung auf die Erfassung der Worthäufigkeiten zurückgegriffen. Dieser Vorgehensweise liegt die Annahme zugrunde, dass die Zählung von Wörtern einen unverfälschten Blick auf die zugrundeliegenden Ereignisse und Annahmen liefert. Darüber hinaus entfällt durch diese Methodik eine mögliche Verzerrung durch individuelle Kodierung.⁵⁴ Die Tabelle 1 fasst die durchschnittlichen Beobachtungen der kommunizierten Begrifflichkeiten in insgesamt 110 Geschäftsberichten auf jährlicher Basis zusammen. Da die Geschäftsberichte im Untersuchungszeitraum deutlich umfangreicher und detaillierter geworden sind, wurden die Begrifflichkeiten im Verhältnis zur Gesamtanzahl der Wörter betrachtet. In der Tabelle wird außerdem die Anzahl der jeweiligen Rechnungslegungsstandards in absoluten Werten mit angegeben.

Tab. 1: Ergebnisse der Inhaltsanalyse

Jahr	2003	2004	2005	2006	2007
Anzahl Wörter	39.573,05	44.014,00	49.044,91	54.751,00	64.162,82
Kommunikation Innovation	20,45	22,68	30,73	29,27	35,05
Kommunikation F&E	10,95	12,59	15,18	16,64	18,68
Komm. Inno./Wörter	0,000541	0,000511	0,000634	0,000618	0,000551
Komm. F&E/Wörter	0,000303	0,000295	0,000328	0,000303	0,000290
HGB	6	4	0	0	0
IFRS	12	15	21	21	22
US-GAAP	4	3	1	1	0

Die Tabelle macht deutlich, dass im Durchschnitt die Geschäftsberichte umfangreicher geworden sind: Im untersuchten Zeitraum kam es fast zu einer Verdopplung der

⁵³ Vgl. *Frazier et al.* (1984), S. 325.; *Landrum* (2008), S. 140.; *Rutherford* (2005), S. 354.; *Spahr* (1999), S. 281ff..

⁵⁴ Vgl. *Früh* (2007), S. 244.

Wortanzahl von 39.573,05 auf 64.162,82. Die Begriffe Innovation und Forschung & Entwicklung wurden absolut betrachtet auch vermehrt genannt, bspw. wurde im Jahre 2003 Innovation durchschnittlich 20,45 mal genannt, im Jahre 2007 hingegen schon durchschnittlich 35,05 mal. Es erscheint allerdings folglich nur eine Betrachtung der Kommunikation von Innovation und F&E im Verhältnis zur durchschnittlichen Wortanzahl der Geschäftsberichte sinnvoll. Die Relevanz des Begriffes Innovation stieg vom Anfangs- bis zum Endzeitpunkt der Untersuchung leicht an von 0,000541 im Jahre 2003 auf 0,000551 im Jahre 2007. Dies entspricht einem Anstieg von ca. 5,71%. Die vermehrte Nennung von Innovation im Jahre 2005 ist besonders bemerkenswert, der Wert von 0,000634 ist deutlich höher als in den übrigen Jahren. Auch bei der Nennung von F&E konnte vom Anfangs- bis zum Endzeitpunkt der Untersuchung ein leichter Anstieg verzeichnet werden, von 0,000303 im Jahre 2003 auf 0,000290 im Jahre 2007 was einem Anstieg von ca. 5,12% entspricht. Die Anstiege der Wörter Innovation und F&E bewegen sich somit auf demselben Niveau. Wie leicht zu ersehen ist, werden im Jahre 2003 unterschiedliche Rechnungslegungsstandards verwendet, im Jahre 2005 wenden alle Unternehmen mit nur einer Ausnahme den Rechnungslegungsstandard IFRS an. Darüber hinaus kommt es im Jahre 2005 zu einer vermehrten Nennung von Innovation sowie F&E. Eine mögliche Erklärung könnte sein, dass durch den Wechsel von US-GAAP und HBG zu IFRS intensiver über Innovationen und F&E berichtet worden ist.

4.3 Entwicklung der Kommunikationsmuster

Aus der ganzheitlichen Betrachtungsweise von F&E-Intensität, F&E-Produktivität und der Innovationskommunikation, erfasst anhand der quantitativen Inhaltsanalyse, lassen sich Aussagen über die Stringenz und Transparenz der Kommunikation von Innovationsaktivitäten bei den untersuchten Unternehmen treffen. Unter Berücksichtigung der differenzierenden Branchencharakteristika, können den Unternehmen im Folgenden bestimmte Kommunikationsmuster zugeordnet werden. Für eine Branche B mit n Unternehmen betrachtet man die Funktion

$$\Psi_{B,n}(x, y, i) := \frac{x_i}{y_i} - \frac{1}{2} \left(\frac{x_{B, \lfloor \frac{n}{2} \rfloor}}{y_{B, \lfloor \frac{n}{2} \rfloor}} + \frac{x_{B, \lfloor \frac{n}{2} \rfloor + 1}}{y_{B, \lfloor \frac{n}{2} \rfloor + 1}} \right), \quad (1)$$

für ein Unternehmen $i = 1, \dots, n$ einen Medianvergleich der jeweiligen Werte innerhalb einer Branche. Desweiteren ist

$$\Phi_{B,n}(i) := \mu_1 \cdot \text{sgn}(\Psi_{B,n}(F, U, i)) + \mu_2 \cdot \text{sgn}(\Psi_{B,n}(P, U, i)) + \mu_3 \cdot \text{sgn}(\Psi_{B,n}(I, W, i)) \quad (2)$$

Mit $\mu_1 > \mu_2 > \mu_3 > 0$ und der Signumfunktion sgn definiert. Die Variable F steht für die Ausgaben für F&E, U für den Umsatz, P für die Anzahl von Patentanmeldungen, I steht für die Innovationskommunikation im Geschäftsbericht und W für die Gesamtzahl Wörter in den Geschäftsberichten. I , die Innovationskommunikation ergibt sich aus der Addition der Ergebnisse der quantitativen Inhaltsanalyse. So lassen sich die Kommunikationsmuster (KM) mittels einer Fallunterscheidung zusammenfassen als

$$KM(i) := \begin{cases} \text{Erfolgskommunikator,} & \text{falls } \Phi_{B,n}(i) = \mu_1 + \mu_2 + \mu_3 \\ \text{Erfolgreiche Berichtsverweigerer,} & \text{falls } \Phi_{B,n}(i) = \mu_1 + \mu_2 - \mu_3 \\ \text{Produktivitätschwache Kommunikator,} & \text{falls } \Phi_{B,n}(i) = \mu_1 - \mu_2 + \mu_3 \\ \text{Produktivitätschwache Berichtsverweigerer,} & \text{falls } \Phi_{B,n}(i) = \mu_1 - \mu_2 - \mu_3 \\ \text{Produktivitätsstarke Kommunikator,} & \text{falls } \Phi_{B,n}(i) = -\mu_1 + \mu_2 + \mu_3 \\ \text{Produktivitätsstarke Berichtsverweigerer,} & \text{falls } \Phi_{B,n}(i) = -\mu_1 + \mu_2 - \mu_3 \\ \text{Schönredner,} & \text{falls } \Phi_{B,n}(i) = -\mu_1 - \mu_2 + \mu_3 \\ \text{Ignorant,} & \text{falls } \Phi_{B,n}(i) = -\mu_1 - \mu_2 - \mu_3 \\ \text{nicht verwertbar,} & \text{sonst.} \end{cases} \quad (3)$$

Das Kommunikationsmuster eines Unternehmens ist nicht verwertbar, falls eine der Signumfunktionen in Φ den Wert 0 liefert. Um zu überprüfen, inwiefern externe Stakeholder diese Kommunikationsbemühungen evaluieren, werden die unternehmensspezifischen Kapitalmarktentwicklungen nachvollzogen. Ausgangszeitpunkt ist somit der Eröffnungskurs der Unternehmen am Tage der Veröffentlichung des Geschäftsberichtes ($t_0=0$). Daran anschließend wurden die Unternehmensbewertungen zu den Zeitpunkten $t_0 + 1$, $t_0 + 7$, $t_0 + 14$, $t_0 + 30$ erfasst, t steht für Tage. Da der Aktienkurs eines Unternehmens an sich nur bedingt aussagekräftig ist und sich folglich nur unzureichend singuläre Aufschlüsse über die Kursentwicklung nachzeichnen lassen, werden die Aktienkurse im Verhältnis zu den jeweiligen Branchenentwicklungen betrachtet:

$$n_i = \left(\frac{\omega_i(t) - \omega_i(0)}{\omega_i(0)} - \frac{\omega_B(t) - \omega_B(0)}{\omega_B(0)} \right) \cdot 100 \quad (4)$$

Hier bezeichnet B die jeweilige Branche, mit n Unternehmen und somit $\omega_B(t)$ den Aktienindex der Branche zum Zeitpunkt t und $\omega_i(t)$ den Aktienkurs eines Unternehmens $i = 1, \dots, n$ zum Zeitpunkt t . So liefert n_i die Aktienkursentwicklung eines Unternehmens, bereinigt um die Gesamtentwicklung der jeweiligen Branche,

ausgedrückt im jeweiligen branchenbezogenen Börsen-Teilindex. Um die Branchenentwicklung abzubilden, wurden folgende deutsche Indexe herangezogen: Der Automobile-Performance-Index (ISIN: DE0009660084), der Chemicals Performance-Index (ISIN: DE0009660126) und der Industrial Performance-Index (ISIN: DE0009660290).

Um die Bewertung am Kapitalmarkt nachzuzeichnen, wird eine Regressionsschätzung der Paneldaten unternommen, welche mit spezifischen Herausforderungen verbunden ist.⁵⁵ Die Veränderungen in den um Brancheneffekte bereinigten Aktienkursen der Unternehmen werden als abhängige Variablen betrachtet, die Kommunikationsmuster als unabhängige Variable. Der Hausman-Test ist zu allen Zeitpunkten nicht signifikant, somit ist eine Schätzung mit fixed-effects anzuraten, weshalb folgendes Modell anzunehmen ist:

$$\sum_{i=0}^n y_t = \beta_0 + \beta_1 \sum_{k=0}^n x_{it} + v_i + \varepsilon_{it} \quad (5)$$

Wobei y_t als Veränderung der bereinigten Aktienkurse an (t_0) Tagen gilt und x_{it} für die Kommunikationsmuster steht. v_i ist der unternehmensspezifische Fehlerterm und ε_{it} der idiosynkratische Fehlerterm.

5 Ergebnisse der empirischen Untersuchung

5.1 Deskriptive Statistiken

Die Tabelle 2 liefert einen Überblick hinsichtlich der wichtigsten deskriptiven Kennzahlen sowie den Korrelationen der Stichprobe. Die Werte in Tabelle 2 werden als Paneldaten behandelt. Der Mittelwert (19.872,29) sowie die Standardabweichung (35.443,096) zeigen dass die Umsätze der Unternehmen starke Unterschiede ausweisen, es sich durchschnittlich betrachtet aber um große Unternehmen handelt. Die Werte der Variable Umsatz stehen in keiner signifikanten Beziehung zu den Variablen F&E-Intensität und F&E-Produktivität, dies bedeutet, dass größere Unternehmen relativ gesehen nicht mehr in F&E investieren und auch nicht mehr Patente anmelden als kleinere Unternehmen bezogen auf den Umsatz. Die F&E-Intensität korreliert signifikant positiv mit der Variable Ko. F&E/Wörter ($r = ,37; p < ,01$), steht jedoch in

⁵⁵ Vgl. *Greene* (2008), S. 181ff.

keiner signifikanten Beziehung zu der Variable Ko. Innovation/Wörter. Hinsichtlich der Forschungsfragen 1a und 1b kann somit folgende Proposition aufgestellt werden:

P.1 *Eine hohe F&E-Intensität wird via F&E kommuniziert jedoch nicht via Innovation.*

Tab. 2: Mittelwert, Standardabweichung und Korrelationen nach Pearson, (gültiges N = 102)

	Mittelwert	Std.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Umsatz (Mio. €)	19.872,29	35.443,96	1	,95**	,58**	-,10	-,19	,09	-,19
(2) F&E-Kosten (Mio. €)	860,31	1.463,31		1	,56**	,03	-,21*	,08	-,19
(3) Patentanmeldungen	635,60	971,51			1	-,02	-,15	,33**	-,06
(4) F&E-Intensität (%)	5,08	2,97				1	-,12	,10	,37**
(5) F&E-Produktivität (%)	1,80	2,76					1	,21*	,05
(6) Ko. Innovation/Wörter	,000571	,000462						1	,06
(7) Ko. F&E/Wörter	,000304	,000188							1

*bzw.** kennzeichnen Signifikanz auf dem Niveau von 0,05 bzw. 0,01 (2-seitig)

Die F&E-Produktivität korreliert signifikant positiv mit der Variable Ko. Innovation/Wörter ($r = ,21$; $p = ,05$), steht jedoch in keiner signifikanten Beziehung zur Variable Ko. F&E/Wörter. Somit kann hinsichtlich der Forschungsfragen 2a und 2b folgende Proposition aufgezeigt werden:

P.2 *Eine hohe F&E-Produktivität wird via Innovation kommuniziert jedoch nicht via F&E.*

5.2 Verteilungen der Kommunikationsmuster

Aus der in 4.3 beschriebenen Methodik ergibt sich in Tabelle 3 die folgende Verteilung der Kommunikationsmuster. In der ersten Zeile befinden sich die Kommunikationsmuster mit hoher F&E-Intensität, in der zweiten solche mit niedriger. Die Häufigkeitsverteilungen (in den Tabellen als Vert. Abgekürzt) sind in Prozent angegeben.

Tab. 3: Verteilungen der Kommunikationsmuster

Kommunikationsmuster	Häufigkeit
„Erfolgskommunikator“	6,58%
„Erfolgreiche Berichtsverweigerer“	14,47%
„Produktivitätsschwache Kommunikator“	13,16%
„Produktivitätsschwache Berichtsverweigerer“	13,16%
„Produktivitätsstarke Kommunikator“	17,11%
„Produktivitätsstarke Berichtsverweigerer“	9,21%
„Schönredner“	14,47%
„Ignorant“	11,84%

Es zeigt sich, dass das Kommunikationsmuster „Erfolgskommunikator“ relativ gesehen schwach ausgeprägt ist (6,58%). Der „Erfolgskommunikator“ zeichnet sich durch eine relativ hohe F&E-Intensität und F&E-Produktivität bei stark ausgeprägter Innovationskommunikation aus. Dieses Kommunikationsmuster ergibt sich bspw. bei den Unternehmen Heidelberger Druckmaschinen im Jahre 2005 oder König & Bauer im Jahre 2003. Mangelnde Innovationskommunikation im Sinne des „erfolgreiche Berichtsverweigerer“ kann bspw. Porsche in den Jahren 2004, 2005, 2006 und 2007 vorgeworfen werden. Dieses Muster lässt sich erstaunlicherweise verhältnismäßig häufig nachweisen (14,47%), was jedoch nicht im Sinne eines glaubwürdigen Value-Reportings ist, denn vorhandene Werte werden nicht adäquat kommuniziert. Der „produktivitätsschwache Kommunikator“ findet sich im selben Verhältnis wie der „produktivitätsschwache Berichtsverweigerer“ in der Stichprobe wieder (13,16%). Als Beispiele für das erstgenannte Muster lässt sich bspw. Altana im Jahre 2003 und für das letztgenannte Muster BMW 2007 nennen. Der „produktivitätsstarke Kommunikator“ lässt sich in der Stichprobe am häufigsten nachweisen (17,11%). So kann beispielweise BASF in allen Jahren des Untersuchungszeitraums diesem Kommunikationsmuster zugeordnet werden.

Als „produktivitätsstarke Berichtsverweigerer“ ist durch niedrige F&E-Intensität, hohe F&E-Produktivität bei jedoch schwach ausgeprägter Innovationskommunikation gekennzeichnet, dieses Kommunikationsmuster ergibt sich in 9,21% der Fälle, der zweitgeringste Wert innerhalb dieser Studie. Das Kommunikationsmuster „Schönredner“ ergibt sich in 14,47% der Fälle, das Muster „Ignorant“ in 11,84% der

Fälle. Der „Schönredner“ weist eine stark ausgeprägte Innovationskommunikation bei schwach ausgeprägter F&E-Intensität und F&E-Produktivität auf; der „Ignorant“ verzeichnet bei allen drei Attributen schwach ausgeprägte Werte.

5.3 Bewertung am Kapitalmarkt

Hinsichtlich der Forschungsfrage 3 sind die Ergebnisse der Panelschätzung in Tabelle 4 abgetragen. Es zeigt sich zu allen Zeitpunkten keine statistische Signifikanz, d.h. glaubwürdige Kommunikation wird am Kapitalmarkt nicht positiv bewertet. Auch die unglaubwürdige Kommunikation zieht keine negative Bewertung der Aktienkurse an den untersuchten Zeitpunkten nach sich. Es lassen sich darüber hinaus auch keine signifikanten Auswirkungen nachweisen, falls die jeweiligen Kommunikationsmuster in der Panelschätzung als unabhängige Variable betrachtet werden.

Tab. 4: Ergebnisse der Regression mit einem fixed-effects Modell zu unterschiedlichen Zeitpunkten

Abhängige Variablen	Ver. Aktienkurs $t_0 + 1$		Ver. Aktienkurs $t_0 + 7$		Ver. Aktienkurs $t_0 + 14$		Ver. Aktienkurs $t_0 + 30$	
Unabhängige Variablen	Koeffizient	z-Wert	Koeffizient	z-Wert	Koeffizient	z-Wert	Koeffizient	z-Wert
Glaubwürdige Kommunikation	-0,00990	-0.98	-0,00872	-0.56	-0,0212	-1.05	-0,0682	-1,89
Unglaubwürdige Kommunikation	-0,00112	-0.08	0,0213	1.03	0,0145	0.55	-0,0245	-0,52
Konstante	-.0070432	-0.91	-.0066066	-0.57	-.0011912	-0.08	.027673	1.05
N			97		97		97	
R² within	0,0785		0,0355		0,0606		0,0283	
R² between	0,1103		0,5387		0,3391		0,4216	
R² overall	0,0779		0,1829		0,1139		0,0962	
Chi²	0,7250		0,0488		0,3532		0,5176	

*bzw. ** kennzeichnen Signifikanz auf dem Niveau von 0,05 bzw. 0,01 (2-seiti

Folglich kann hinsichtlich 3a und 3b folgende Proposition festgehalten werden:

P.3 *Die Glaubwürdigkeit der Innovationskommunikation hat auf die Bewertung von Unternehmen am Kapitalmarkt keine Auswirkungen.*

6 Diskussion der Ergebnisse

6.1 Limitationen

Bei der vorliegenden Stichprobe muss betont werden, dass es sich hier ausschließlich um deutsche Unternehmen aus der verarbeitenden Industrie handelt, bei denen überwiegend technologisch getriebene Produkt- und Prozessinnovationen vorliegen. Auf Dienstleister sowie Klein- und Mittelständische Unternehmen kann die Forschungsmethodik prinzipiell angewendet werden, jedoch lassen sich die bisher gewonnenen Ergebnisse (auch anhand der verwendeten Innovationsindikatoren) nicht unmittelbar übertragen. Darüber hinaus muss in diesem Zusammenhang festgehalten werden, dass für die Untersuchung der Innovationsbemühungen die Indikatoren F&E-Intensität und F&E-Produktivität verwendet wurden, in der quantitativen Inhaltsanalyse jedoch die Begrifflichkeiten F&E und Innovationen betrachtet worden sind. Dies liegt einerseits daran, dass F&E-Intensität und F&E-Produktivität der Innovation zumeist vorgelagert sind und diese bedingen. Andererseits liegt es daran, dass kein weitergehendes Datenmaterial (bspw. Anzahl der Neuprodukte) für die Unternehmen verfügbar war, welches Innovationen exakter hätte abbilden können. Die Bemessung der Glaubwürdigkeit, hier am Beispiel von Innovationskommunikation, ist sicherlich ein schwierig zu erfassendes Phänomen. In diesem Papier wurde über die allgemeine Glaubwürdigkeit bzw. Nicht-Glaubwürdigkeit geurteilt, im Sinne einer Übereinstimmung von Aussagen und Tatsachen. Allerdings wird Glaubwürdigkeit an sich Personen-individuell determiniert und ist von weiteren Faktoren wie bspw. der Erfahrung hochgradig abhängig.

Darüber hinaus konnte bei einigen Unternehmen eine Veränderung der Kommunikationsmuster im Untersuchungszeitraum festgestellt werden. Die hier vorgestellte Methodik identifiziert nur jahresbezogene Kommunikationsmuster, die Veränderungen der

Kommunikationsmuster können bisher nicht explizit berücksichtigt werden, allerdings ließen sich auch auf jahres- oder branchenbezogener Ebene keine Schemata erkennen.

6.2 Implikationen für Wissenschaft und Praxis

Eine wertorientierte Unternehmensführung verspricht durch freiwillige und über die vorgeschriebenen Richtlinien hinausgehende Offenlegung von Information eine positive Bewertung am Kapitalmarkt und daraus resultierende niedrige Finanzierungskosten. Langfristig schafft glaubwürdige Kommunikation Vertrauen in ein Unternehmen und stärkt dessen Reputation. Anhand der beschriebenen Methodik konnte aufgezeigt werden, dass manche Unternehmen ihre Investitionen und Erfolge in F&E, in Relation zur jeweiligen Branche, jedoch nicht adäquat kommunizieren. In diesen Fällen bestehen Verbesserungspotentiale in der operativen Umsetzung der Innovationskommunikation. Auch konnten Unternehmen identifiziert werden, die ihre Forschungs- und Entwicklungstätigkeit, trotz niedriger Investitionen und Erfolge sehr intensiv kommunizieren.

Es konnte aufgezeigt werden, dass eine hohe F&E-Intensität im Geschäftsbericht über die Wörter „F&E“ kommuniziert, jedoch nicht über die Wörter „Innovation“ kommuniziert wurde. Dieser Tatbestand entspricht einer transparenten Innovationspolitik, Unternehmen die in F&E investieren kommunizieren diese Ausgaben dementsprechend. Eine hohe F&E-Produktivität geht einher mit einer ausgeprägten Nennung von „Innovation“. Die F&E-Produktivität steht jedoch in keinem Zusammenhang mit der Nennung von F&E. Patente als zentraler Baustein der tatsächlichen Innovation, werden entsprechend intensiv kommuniziert. Die Unternehmen kommunizieren folglich ihre technologische Leistungsfähigkeit und Innovationfähigkeit im Sinne eines strategischen Value Reportings.

Die Glaubwürdigkeit der Innovationskommunikation zeigte im Untersuchungszeitraum keine Auswirkungen auf die Entwicklung des Aktienkurses der betrachteten Unternehmen. Dies kann einerseits daran liegen, dass externe Stakeholder zwar die Innovationskommunikation erfassen, jedoch keine Bewertung über die tatsächlich geleisteten Investitionen und Erfolge in F&E vornehmen können, da diese keiner allgemein vergleichbaren Veröffentlichungspflicht unterliegen. Andererseits kann die fehlende Signifikanz auch auf die Volatilität und Abhängigkeit von zahlreichen Faktoren des Aktienkurses zurückgeführt werden. Denn ein Kommunikationsverhalten im Sinne des „Schönredners“ kann sicherlich zu

Glaubwürdigkeitsverlusten bspw. Reputationsschädigungen führen, auch wenn dies nicht nachgewiesen werden konnte.

6.3 Ausblick

Die hier vorgestellte der Kombinatorik entlehnte Methodik stellt eine neuartige Betrachtungsweise von Innovationskommunikation und des Innovation Reporting dar. Es wäre sicherlich interessant, diese Methodik auf eine großzahlige, internationale Stichprobe anzuwenden, um zu überprüfen, ob sich die gewonnenen Ergebnisse bestätigen. Zukünftige Forschungsfragen könnten sich u.a. damit befassen, unter welchen Bedingungen und Ursachen Unternehmen ihre Kommunikationsstrategie im Zeitablauf ändern. Hat beispielweise eine Änderung der Eignerstruktur einen Einfluss auf die Innovationskommunikation? Sicherlich wäre es auch interessant, falls eine geeignete Datenbasis vorhanden ist, in welchem Verhältnis die Anzahl der Neuprodukte zur Innovationskommunikation steht. Im Sinne der Corporate Identity verleihen sich Unternehmen häufig die Reputation eines Technologieführers oder eines besonders innovativen Unternehmens. Hier böte es sich an, die Unternehmen entsprechend ihres Selbstverständnisses zu gliedern und anschließend die gewonnene Forschungsmethodik anzuwenden. Stimmen die Corporate Identity und die Kommunikationsmuster überein?

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Summary

This paper empirically examines how companies report and communicate their R&D and innovation efforts. This is done by a quantitative content analysis of annual reports from 2003 to 2007 from 22 German companies from three industries, namely Automobiles & Parts, Chemicals and Industrial Engineering. Based on a combinatorial method, we are identifying different types of communication patterns. These patterns are grouped concerning their credibility, in the sense of accordance of assertion and fact. Therefore we empirically examined the investments in R&D, the quantity of the patent filings and how this has been communicated within the annual reports. We prove that some companies do not accurately report and communicate their R&D and innovation efforts, some companies even *sugarcoat* these efforts. Using a fixed-effects model we examine if the credibility of the communication is linked to different valuations on the stock market; finding no significant results, (not-) credible communication is not valued (negatively) positively.

Essay VIII:

Assessing Organizational Innovativeness – Evidence from multinational corporations

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Status: *The ins and outs of professional discourse research, Internatinonal Symposium by Association of Business Communication, Modena, Italien, 06.-07.03.2014 (under review), 1-26.*

Assessing Organizational Innovativeness – Evidence from Multinational Corporations

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ABSTRACT:

The capacity to innovate, called organizational innovativeness (OI), is becoming the single most important task in organizational survival. However, multinational corporations (MNCs), which are accountable to various stakeholders, must communicate their OI, amongst other reasons for effective capital allocation. Therefore, stakeholders demand organizational transparency, which results in trust and that advances growth and profit. The problem is that quantitative measurement of OI and especially how it is communicated to stakeholders has been neglected. In response, this study introduces a method to assess the communication of OI through a quantitative content analysis. Annual reports from 326 organizations from 1998 to 2008 are examined. Empirical results show that the more that is invested in the OI the more it is communicated. This result indicates that organizations are aware of the benefits of transparency and trust in organizations, and subsequently adjust their communications efforts.

Keywords: Organizational Innovativeness, Corporate Communications, Transparency, Trust, Multinational Corporations, Research & Development, Annual Reports.

Modern organizations must continuously adapt to today's highly dynamic environment (Salavou, 2004). Internally, they face constant pressure to innovate, alter managerial processes, and re-structure to fit changing surroundings. Externally, innovative organizations develop or modify new products/services for existing or new markets (Shoam, Vigoda-Gadot, Ruvio & Schwabsky, 2012). The ability to innovate, also called organizational innovativeness (OI), is becoming the single most important attribute in determining firm survival and succession (Rubera & Kirca, 2012; Doyle, 1998; Quinn, 2000). In general, the term "innovativeness" has been employed either to describe an individual innovation and its impact and relevance (Kleinschmidt & Cooper, 1991; Garcia & Calantone, 2001; Brockman & Morgan, 2003) or to describe the culture of an organization, such as its capacity to innovate (Woodside, 2004; Hurley, Hult, & Knight, 2005), and thus as a precursor to innovative performance. As part of an organization's capacity to innovate, in later stages, OI reflects the potential to generate innovations (Paleo & Wjinberg, 2008).

Scholars have examined innovativeness and ample research of the communication of innovativeness also exists. However, there is a void of information on the assessment of a comprehensive OI, since most research only partially assesses the organizational innovativeness (see Weiss, Falk, & Zion, 2012; Guo, Lev, & Zhou, 2004; Acs, Anselin, & Varga, 2002; Gilbert, 2007; Sabir & Kalyar, 2013). This incomplete assessment can result in undervaluation or overvaluation of organizations to be innovative (Paleo & Wjinberg, 2008; Jaffe & Lerner, 2007). Also related to accurate assessment of innovation is the major issue of transparency. Transparency can lead to trust in the organization. Transparency and trust can serve as a competitive advantage that lead to profit, growth and effective capital allocation (Bushman & Smith, 2003; Armstrong, Guay, & Weber, 2010). For these reasons, corporate communications that exhibit transparency and elicit trust are highly desirable by organizations.

The goals of this paper are twofold. The first goal is to develop a method to assess the communication of the Organizational Innovativeness. The second goal is to examine the transparency efforts of multinational corporations regarding their OI. The reasons these goals are important because is there is a void of information on the communication of OI and the corresponding transparency and trust issues, being exceedingly decisive in today's highly dynamic environment. To accomplish these goals, we summarize the literature concerning OI and transparency and trust. We demonstrate how quantitative content analysis can be used to assess the communication of OI. Then we share an empirical study that seeks to determine the relationship of the OI of multinational corporations and their communication behavior towards OI. We discuss the results and provide managerial implications.

Organizational Innovativeness

Organizational Innovativeness entails more accessibility to change and more willingness to face new challenges (Skerlavaj, Stemberger, Skrinjar, & Dimovski, 2007). It equips the organization to leverage the capabilities of an innovative workforce and thereby better respond to environmental changes (Swink & Mabert, 2000; Gilbert, 2007). Extant research mostly conceptualizes OI as the number of adoptions of innovations and treats organizations as innovative if they adopt many innovations (Subramanian & Nilakanta, 1996; Salavou, 2004). Somewhat differently, Hurley and Hult (1998) conceptualize OI as a cultural organizational trait, which refers to organizations' innovation orientation. With a related view, Lumpkin and Dess (1996) regard OI as reflecting an organization's inclination to seek new ideas that can lead to the development of new services or products. These latter views imply that OI is an organizational characteristic, a part of its culture that reflects its readiness to seek new opportunities, which leads to a capacity to innovate and

innovations. This capacity, in turn, leads to successfully adopted or implemented innovations (Hurley & Hult, 1998; Hausman, 2005). Accordingly, OI mirrors the mere potential of organizations to produce innovations (Paleo & Wjinberg, 2008).

Results of studies of the preconditions that give rise to innovativeness in organizations have been mixed (Abratt & Lombard, 1993; Henard and Szymanski, 2001; Poolton & Barclay, 1998). For instance, Johnson, Donohue, Atkin, & Johnson (2001) study the perceived innovativeness in one organization and find that effective communication within an organization has positive effects on the perceived innovativeness of the firm. Other scholars have highlighted the importance of building relationships as means for promoting OI (Holmen, Pedersen, & Torvatn, 2005), cultural differences (Sabir & Kalyar, 2013), organizational size (Nystrom, Ramamurthy, & Wilson, 2002; Liberatore & Breem, 1997; Gopalakrishnan & Damanpour, 2000), as well as market orientation (Menguc & Auh, 2006). Other perspectives of innovativeness are manifold; it has been labeled as one-dimensional (Shoam et al., 2012) or multidimensional (Subramanian & Nilakanta, 1996). Wang & Ahmned (2004) show how OI has been differentiated on a product, market, process, behavior and strategic level.

The ample research literature on the assessment of the OI has generated a variety of research approaches (Lyon, Lumpkin, & Dess, 2000). In most studies, OI is assessed through questionnaires within organizations (For example see Shoham et al., 2012; Leekpai & Jaroenwisan, 2013; Semerciöz, Hassan, & Aldemir, 2011; Hsu, 2007). Shoam et al. (2012) examine OI across cultures, question Slovakian, Lithuanian and Israeli employees, and find that market and learning orientation enhanced organizational innovativeness. In addition to questionnaires, OI is also being assessed by observing the number of products introduced in the market (Ettlie, 2006), the number of adopted innovations (Subramanian & Nilakanta, 1996), or the number of R&D-personnel or patents

(Acs et al., 2002; Abraham & Moitra, 2001). In yet another research approach, R&D-Intensity is a commonly used and reliable proxy to assess the innovative potential of an organization (Hagedoorn & Cloudt, 2003, Quintana-García & Benavides-Velasco, 2008). R&D-Intensity on an organizational level is being defined as the ratio of expenditures on research and development to the sales (Lee & Noh, 2009). For an extensive overview of the different approaches on the evaluation of the OI see Salavou (2004). However, even if multiple assessments of OI are used concurrently, they may still only partially assess the entire innovative potential of an organization, since the levels of OI are so manifold (Wang & Ahmned, 2004). No assessment that specifically investigates communication efforts regarding OI was found.

Transparency and Trust

Corporate transparency, according to Bushman, Piotroski, & Smith (2004, p.210) is *“the widespread availability of firm-specific information concerning publicly listed firms in the economy to those outside the firm”*. Transparency is of vital importance to organizational survival since various stakeholders are demanding transparency from organizations (Bentele & Seidenglanz, 2008). The most influential stakeholders appear to be shareholders, national and international watchdog organizations, and the mass media (Wehmeier & Raaz, 2012). The dot-com bubble burst of 2001 and the financial crisis of 2008/2009 have increased the desire for transparency; concurrently new regulations concerning reporting and financial disclosure have emerged (e.g. the Sarbances-Oxleys-Act of 2002). The call for transparency has changed the corporations’ mindset regarding financial disclosure from reactive to proactive communication behavior (Billings & Capie, 2009). All this implies that internal and external stakeholders not only expect to obtain unrestricted access to corporate information, but also demand that organizations be held

accountable for their strategic choices and consequently for their corporate communications (Christensen, 2002). Recent managerial arguments for transparency and the disclosure of information assert that the reason for organizations to become transparent is not respect for stakeholder rights, but competitive advantage, growth, profit and effective capital allocation (Aksu & Kosedag, 2006, Armstrong et al., 2010). Transparency is likewise proclaimed as a means of restoring credibility with suppliers or customers (Elia, 2009). It is often viewed as a precondition for trust in the corporation itself (Bentele & Seidenglanz, 2008; van Riel, 2000). Trust in organizations is viewed as highly desirable since it reduces perceived risk and vulnerability from opportunism from customers or suppliers (Andaleeb, 1995). Examples of research on positive outcomes of trust by organizations include convenience stores (Chiou, Hsieh, & Yang 2004) or franchises (Dickey, McKnight, & George, 2007).

In essence, transparency and trust in an organization can only be established if the communication behavior is congruent with the actual facts (Fassin & Buelens, 2011). The concept of this congruency is based on the correspondence theory of truth, which proposes that statements are true because they correspond with the underlying reality (Henriques, 2007). Even though that transparency and trust are appraised as vital elements of long-term success or even competitive advantage (Armstrong et al., 2010), studies have shown especially that trust is highly fragile. Trust is difficult to build but easy to lose (Conchie & Burns, 2008; Swift, 2001). For instance, Slovic (1993) illustrates the fragility of trust through a trust asymmetry principle, where negative risk information reduces trust more than positive information increases trust. These asymmetrical effects of positive and negative information on the public's trust have been highlighted with respect to many social risks, ranging from nuclear power (Cvetkovich, Siegrist, Murray, & Tragesser, 2002) genetically modified foods (Poortinga & Pidgeon, 2004), to food additives (White, Pahl, Buehner, & Haye, 2003).

Research questions

We can conclude that the OI can be viewed from diverse perspectives and levels (Van de Ven, Polley, Garud, & Venkatraman, 2008; Subramanian & Nilakanta, 1996). Nevertheless scholars agree that OI is becoming more and more important and this importance should be mirrored in the corporate communications efforts (Johnson et al., 2001). Furthermore, transparency and trust are vital for firm survival, especially for multinational corporations, since their communication behavior is closely watched by numerous stakeholders. However, the literature lacks studies on transparency and trust related to the organizational innovativeness of corporations. To respond to this void, we conducted a quantitative content analysis of large multinational corporations, that seeks to answer these questions:

Research Question 1: Since the organizational innovativeness is becoming progressively important for firm survival, will there also be an increase in the communication regarding organizational innovativeness?

Research Question 2: Is there a relationship between the organizational innovativeness and the communication of organizational innovativeness and the transparency?

Method

To respond to the research questions, we focused on corporations with high expenditures on research & development (R&D) and choose the 500 international publicly listed corporations with the highest global R&D expenditures worldwide according to the British Department for Business Innovation & Skills (R&D Scoreboards, 2008) in 2008. We aimed at corporations with high expenditures on R&D, since they are more likely to exhibit OI (Engelen & Brettel, 2012). To study the transparency efforts, we examined how

the OI and the communication of the OI are related. The OI was measured by using a proxy, the R&D-Intensity (measured by the ratio of the expenditures on research and development to the ratio of organizations sales) of the corporation's (Lee & Noh, 2009). R&D-Intensity is a commonly used and reliable proxy for the innovative potential of a firm (Hagedoorn & Cloudt, 2003, Quintana-García & Benavides-Velasco, 2008). Financial data and expenditures on R&D were taken from Bureau van Dijk and its Osiris database (Li Moshirian, Pham & Zein, 2006).

To achieve a comprehensive and comparable overview of the firm's communication of the OI, we concentrated solely on annual reports. No Form 10-K or 20-F were considered. Annual reports were used because of the international sample, and annual reports provide, to a certain degree, transnational comparability (Clatworthy, 2005; Roberts, Weetman & Gordon, 2005). The sample period of 1998 to 2008 was selected for two main reasons: (1) because before 1998 few annual reports were available in digitalized format (we only studied digital annual reports) and (2) after 2008 the outcomes of the worldwide financial crisis were skewing the data heavily. After eliminating corporations that do not publish an annual report or for which no data on R&D via the Osiris database were available, 326 corporations of the original 500 remained in the final sample. For each of these 326 corporations, we sought annual reports for each of the 11 years, resulting in 3043 annual reports.

Quantitative Content Analysis

Content analysis as a research method is a systematic and objective technique of describing and quantifying phenomena (Krippendorff, 1980; Loughran & McDonald, 2011; Indulska, Hovorka, & Recker, 2012). The quantitative part focuses on fixed selected characteristics,

such as word frequencies, to ensure a high degree of reproducibility (Boettger & Palmer, 2010).

Methodological Applications of Content Analysis

Quantitative Content analysis is utilized by scholars within the business and management disciplines. In general, content analysis is based upon the concept, that the occurrence of specific words and their composition are an important indicator for the identification of hidden agendas and coherences (Breton, 2009). Examples of related content analysis applications include these: Papastathopoulou and Hultink (2012) or Page and Schirr (2008), who examine the New Service Development; or Anderson, De Dreu & Nijstad who (2004) explore the facilitators of innovation; Baregheh, Rowley, & Sambrook (2009) appraise a multidisciplinary definition of innovation; whereas Dahlander and Gann (2010) try to clarify the “openness” in open innovation.

Other scholars who employ quantitative content analysis are Droge, Stanko, & Pollitte (2010), who examine the Blogs of lead users and early adopters concerning New Product Development; Gerhard, Brem, Baccarella, & Voigt (2011) screen advertisements of high-technology products; Albino, Balice, Dangelico, & Iacobone (2012) study the influence of the adoption of environmental strategies on green product development, Entwistle (1999) analyses the R&D disclosure; Pan and Zhang (2011) measure the innovativeness of product-specific reviews, Ceci and Iubatti (2012) examine the innovation diffusion in SME networks; Howell and Boies (2004) measure the creation and promotion of ideas in the innovation process; Wibon (2002) examines how the technology management influences the initial public offering of high-technology firms.

Studies have concluded that the quantitative content analysis is a suitable instrument for analyzing the strategic positioning of firms (Frazier, Ingram, & Tenn, 1984; Landrum, 2008; Rutherford, 2005).

Assessing the communication of OI

One of our goals was to examine the communication efforts regarding Organizational Innovativeness. This was accomplished by analyzing the occurrences of the following non case-sensitive terminologies in the 3,043 annual reports:

- *R&D (also with spaces)*
- *Research & Development*
- *Research and Development*
- *Innovation*
- *Innovative*

A software program, MAXQDA, designed for qualitative and quantitative data, text and multimedia analysis was used (Maxqda.com, 2013). We decided to study the OI of a company not only by the appearances of R&D in different phrasings, but also to include the words “Innovation” and “Innovative” since the entire OI is not only bound to classical R&D-related innovations, but also can encompass, for example, service innovations (Spohrer & Maglio, 2008; Eng, 2011). The focus on fixed words eliminates intercoder reliability biases (McDavid & Hawthorn, 2006; Hughes & Garrett 1990). Because the annual reports within the 11-year sample period had nearly a threefold increase in the mean number of words (Table 1), the frequency of OI terminologies provided by the quantitative content analysis are compared to the length of the respective annual report. For example, Siemens communicates its OI efforts 95 times in its 2003 annual report. This number is then divided by the total number of words in the annual report for that year 75,940 words (e.g. $95/75,940 = .000124$).

Table 1. Mean word length for 3046 annual reports, by year.

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
23,512	27,018	30,266	33,380	39,484	46,412	47,504	53,055	56,179	61,141	64,064

RESULTS

In this section we present the quantitative results to our research questions. Table 2 displays the descriptive statistics. The variable *R&D-Intensity* is calculated by dividing annual sales by annual expenditures on R&D for each year. The Number of data on R&D-Intensity represents the number of the organizations for which data on R&D expenditures exist divided by annual sales. The variable *Communication-OI* reflects the result of the quantitative content analysis of the annual reports and represents the communication of the innovative potential of multinational corporations. Note that towards the end of the sample period the number of corporate annual reports increased. For *R&D-Intensity* this increase is due to the fact that more information was provided by the Osiris database. For *Communication-OI*, simply more annual reports for analysis were available. The mean values for *R&D-Intensity* in 1998 and 1999 were relatively high, followed by a sharp decline. From 1999 to 2000 the mean *R&D-Intensity* decreases by 80.98%. From 2000 to 2008 there is limited variation within the numbers, the means for R&D-Intensity range between 7.39% (2005) and 8.30% (2001). The mean values for *Communication-OI* range from .00131987 (2003) to .00148932 (2006). A small, constant increase from 1998 to 2001 is seen (4.38%) followed by a slight decline from 2001 to 2003 (-6.59%). From 2003 to 2006 it increases again by 12.84%, just to decrease from 2006 to 2008 (-6.21%). Although there are some fluctuations in regard to the different years, from the beginning of the sample period towards the end, an overall increase of 3.59% in the communications efforts of the multinational corporations concerning OI is evident, with an even stronger increase for the last five years. Research question 1 raised the issue if an increase in the communication of OI relates to an increase of OI, our results empirically confirm this notion.

Table 2. Descriptive Statistics from 326 corporations for 11 years

	Number of data on R&D-Intensity	Mean R&D- Intensity	Min.	Max.	Std. Deviation
R&D-Intensity_1998	220	.1175	.0001	6.3008	.4439532
R&D-Intensity_1999	240	.1484	.0003	13.3182	.8688690
R&D-Intensity_2000	252	.0820	.0000	.7427	.0962067
R&D-Intensity_2001	271	.0830	.0000	.7937	.0890760
R&D-Intensity_2002	276	.0826	.0000	.6256	.0813554
R&D-Intensity_2003	283	.0816	.0000	.4549	.0796784
R&D-Intensity_2004	291	.0763	.0008	.4261	.0703785
R&D-Intensity_2005	303	.0739	.0000	.3554	.0689113
R&D-Intensity_2006	302	.0754	.0004	.3383	.0715561
R&D-Intensity_2007	304	.0767	.0005	.3571	.0757665
R&D-Intensity_2008	301	.0821	.0006	.4409	.0806607
	Number of annual reports	Mean Commu- nication-OI	Min	Max.	Std. Deviation
Communication-OI_1998	142	.00135359	.0000	.0096	.001463875
Communication-OI_1999	177	.00135443	.0000	.0069	.001191765
Communication-OI_2000	231	.00136210	.0000	.0081	.001248048
Communication-OI_2001	243	.00141292	.0000	.0065	.001215461
Communication-OI_2002	261	.00137103	.0000	.0074	.001199012
Communication-OI_2003	270	.00131987	.0000	.0083	.001206721
Communication-OI_2004	279	.00143457	.0000	.0062	.001185731
Communication-OI_2005	288	.00145622	.0000	.0176	.001530414
Communication-OI_2006	292	.00148932	.0000	.0074	.001320770
Communication-OI_2007	297	.00143920	.0000	.0077	.001213113
Communication-OI_2008	291	.00140218	.0000	.0070	.001201640

The mean value of the variable Communication_OI is displayed with 8 digits after the decimal point to provide more accuracy, whereas in the rest of the study all numbers are shown with 4 digits after the decimal point.

To determine the reliability of the data, we test for Krippendorff's Alpha (using the SPSS macro provided by Hayes & Krippendorff, 2007), Cronbach's Alpha and Intra-class Correlation Coefficients (two-way mixed average). Table 3 displays the results.

Table 3. Reliability measures

	Krippendorff's Alpha	Cronbach's Alpha	Intra-class Correlation
R&D-Intensity	.8756	.9938	.9245
Communication-OI	.6995	.9663	.7203

The Krippendorff's Alpha values for *R&D-Intensity* (.8756) and *Communication-OI* (.6995) are sufficient for further generalizability. Krippendorff suggests that values greater than .80 allow for firm conclusion and values over .67 approve for tentative conclusions (Osborne, 2008; Bernard & Ryan, 2010). The Cronbach's Alpha statistics for both *R&D-Intensity* and *Communication-OI* are higher than .90, which means both variables show excellent values (Ho, 2006; Petscher, Schatschneider, & Compton, 2013). The Intra-Class Correlation represents a general level of agreement or consensus across the observations (Schnijders & Bosker, 2012; Sheskin, 2004). For *R&D-Intensity* the value is .9245, and regarding *Communication-OI* the value is .7203, which demonstrates high congruence across the observations (Cooper, Hedges, & Valent, 2009). In summary, the statistical results indicate that both *R&D-Intensity* and *Communication-OI* have strong relationships, show a high degree of consistency, and therefore represent reliable measures (Osborne, 2008; Mitchell & Jolley, 2013).

Examining Transparency

We examine the transparency efforts in the sense of the correspondence theory of truth (Kirkham, 2001). This means that the truth or falsity of the statement (here the communication efforts of OI) relates to the world it actually describes (here the OI

measured by R&D-Intensity). To test whether the R&D-Intensity and the communication of the OI are related, we look at the following mixed-effects model:

$$y_{ij} = \beta_0 + \beta_1 x_{ij} + u_j + e_{ij}$$

Where y_{ij} stands for the logarithmic value of communication efforts regarding the OI, x_{ij} measures the logarithmic R&D-intensity, u_j represents the residues of the random-effects of the individual years, and e_{ij} shows the residues of the corporations. We use a mixed-effects model to apply repeated measurements on longitudinal data (Wu, 2010). Moreover, a mixed effects models is superior over other regression models in the event of substantial missing data (Fitzmaurice, Laird, & Ware, 2011) such as the availability of annual reports and data on R&D. We model the corporations as random effects, whereas the other variables are modeled as fixed effects, in order to respond to the hierarchy of the data (Seltman, 2012). Table 4 displays the results of the regression analysis.

Table 4. Model summary

Parameter	Estimate	Std. Error	F	Df	t	Sig.
Intercept	-2.5040	.0173	208833.4685	693.5583	-144.3882	.0000
R&D-Intensity	.1120	.0120	87.3781	799.6943	9.3489	.0000

Research question 2 asked if the multinational corporations are communicating their OI transparently. The results are statistically significant at a high level and the positive coefficient of .1120 indicates that an increase of R&D-Intensity leads to an increase of the communication efforts regarding OI. This illustrates that the multinational corporations within this sample show transparent communication behavior with regards to their OI efforts, meaning the more they invest in R&D, the more they communicate these efforts.

Discussion

This study raised two research questions and investigated the communication efforts regarding the OI of MNCs through a quantitative content analysis of annual reports, and examined the corresponding transparency and trust endeavors. For almost all years within the sample period the mean investments for R&D range between 7.39% and 8.30% percent of the annual sales. This implies that MNCs do invest substantially and continually in R&D. For 1998 and 1999 the mean value for R&D-Intensity is noticeably higher than the other years. This could be because some corporations that were in 2008 among the highest spending corporations on R&D worldwide, did not record large sales but still invested heavily in R&D in 1998-1999.

Research question 1 was assuming since organizational innovativeness is becoming progressively important for firm survival that there will also be an increase in the communication regarding organizational innovativeness. We found an overall increase of the communication of OI during the sample period, the mean values advance from .00135359 in 1998 to .00140218 in 2008 (+ 3.59%), with even higher values in 2005 (.00145622) and 2006 (.00148932). Prior studies utilizing quantitative content analysis have shown that from the occurrences of certain terminologies, conclusions can be drawn regarding the strategic agenda of firms (see, for example, Landrum, 2008; Rutherford, 2005; Breton, 2009). Therefore, the results of this study indicate that not solely do the communication efforts of an organization's OI have perceived an increase in importance; but also it suggests that OI itself has become more and more important for organizations from a strategic point of view.

Research question 2 asked if the corporations are communicating their OI efforts transparently. Using a mixed-effects model, we found that corporations with higher OI also do communicate these efforts accordingly. These findings indicate that the corporations are

aware of the benefits of transparency (see Armstrong et al., 2010; Elia 2009), know about the interdependency of transparency and trust, and recognize the power of trust and its fragility (see van Riel, 2000; Conchie & Burns; 2001). Therefore, MNCs are communicating transparently their OI efforts, which leads to the establishment of trust in the organization and advances long-term success or competitive advantage (Armstrong et al., 2010).

This research contributes to OI literature by introducing a new method (quantitative content analysis) to assess the innovative potential of corporations and insights into the transparency of their communication efforts. This study reaffirms the notion and provides empirical support that transparency and trust are important factors in organizations communication behavior and vital for firm survival (Armstrong et al., 2010). Limitations of the study include the focus on MNCs; the results might differ for small or medium sized firms. Moreover, in the absence of similar research, the results could not be compared to past studies. This study examined only digital annual reports, future studies might include other corporate communication material such as websites. Future research might also consider continuative terminologies regarding the possible OI such as *patents* or *research facilities*. We avoided these kinds of terms because of the ambiguous meanings. Future research might consider our approach as a cornerstone for assessing the OI while also using surveys, or measures of innovation diffusion and new products. A multiple-methods approach will help to assess the innovative potential of organizations more thoroughly.

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Eidesstattliche Erklärung

Hiermit versichere ich an Eides statt, dass ich die vorliegende Dissertation ohne fremde Hilfe angefertigt und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe. Alle Teile, die wörtlich oder sinngemäß einer Veröffentlichung entstammen, sind als solche kenntlich gemacht. Die Arbeit wurde noch nicht veröffentlicht oder einer anderen Prüfungsbehörde vorgelegt.



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Marburg, den 30 September 2013