The Structure and Evolution of Business-to-Business Marketing: A Citation and Co-citation Analysis

Competitive paper

Methodological Research Approach of IMP

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Abstract

Purpose of the paper and literature addressed:

The field of Business-to-Business (B2B) Marketing has grown considerably in the last four decades. However the knowledge about its structure and evolution is limited to a small number of studies; especially comprehensive literature reviews that analyze the body of B2B-literature (Webster 1978; Reid & Plank 2000; LaPlaca & Katrichis 2009). These studies determine subareas of B2B-research, but neither do they deliver any insights about their interrelation nor about the impact of different authors or journals on their formation. Thus the purpose of our study is to (1) identify the most influential documents and journals in the field and (2) to detect the main research fronts of B2B-marketing and their relations by investigating the large amount of citation data available. An additional focus of the present paper will be on the development of the IMP-Group and its influence on the field's evolution.

Research method:

The present paper documents the intellectual structure of B2B-marketing based on citation analysis and author co-citation analysis. In total 55,283 references from 1,392 B2B-articles of the three leading B2B-Journals *Industrial Marketing Management*, *Journal of Business-to-Business Marketing* and *Journal of Business and Industrial Marketing* and other major marketing journals were analyzed. For assessing the evolution of the field a longitudinal study design with four multi-year periods (1972-1978, 1987-1991, 1998-2000, 2007-2009) was chosen.

Research findings:

The key findings of the study reveal a highly dynamic discipline in the first two periods, where new knowledge is exchanged quickly among an increasing number of B2B-researchers; heavily cited researchers in these periods are *P.J. Robinson*, *F.E. Webster* and *Y. Wind*. The corresponding lines of research identified by the co-citation analysis are *Organizational Buying Behavior* and *Personal Selling*, which continue to exist until the fourth period. They are then replaced by upcoming research fields such as *Service Marketing* and *Relationship Marketing*. The emergence of the latter goes along with the development of several more specialized approaches, most notably the network approach of the IMP-Group.

Main contribution:

For the first time bibliometric methods are used to assess the structure and evolution of B2B-marketing research. The broader scope and higher objectivity of this research approach enhances prior studies since the results are solely based on a composite judgment of a large number of citing B2B-authors.

Keywords: B2B-marketing, citation analysis, author co-citation analysis, intellectual development and history

INTRODUCTION

Since the introduction of *Industrial Marketing Management (IMM)* as the first journal with a special focus on business-to-business (B2B) topics in 1972, the field of B2B-marketing has increased substantially in success and has ultimately reached a status of maturity (LaPlaca 2008, p. 181-183; LaPlaca & Katrichis 2009, p. 9; Reid & Plank 2000, p. 10-12). In these conditions it is common practice across various disciplines to treat the literature generated by the scientific community as a research area of its own and through its analysis reveal the intellectual development of the focal discipline (Ramos-Rodriguez & Ruiz-Navarro 2004, p. 981). Researchers benefit from such retrospective studies since a better understanding of a field's past can support a more sophisticated assessment of its current structure and potential future directions (Culnan 1986, p. 156). In the case of B2B-marketing such retrospective studies have been limited to a few general literature reviews. Noteworthy studies for the whole discipline are the four reviews published in a special issue of the *Journal of Business Research* that outline the accomplishments of the four B2B-research outlets *IMM, Advances in Business Marketing and Purchasing (ABMP), Journal of Business and Industrial Marketing (JBIM),* and *Journal of Business-to-Business Marketing (JBBM)* as well as the more comprehensive reviews of Webster (1978), Reid & Plank (2000) and LaPlaca & Katrichis (2009). Reid & Plank (2000) review the business marketing literature by examining over 2000 B2B-articles, of which the contents have been analyzed and classified into twenty-eight specific B2B-topics and respectively seven major B2B-topic areas. For each of the major topics an assessment of the main themes and individual contributions of selected researchers has been provided (Reid & Plank 2000, p. 13). LaPlaca & Katrichis (2009) share the basic conceptual approach of analyzing the content of published works to reconstruct the topical coverage and development of the field. In their case six major research areas are defined and their relative concentration, measured by the amount of annual publications between 1936 and 2006, is described. Among others their results show that the most frequently published area of research in B2B-marketing is *Organizational Buying Behavior*, which was the focus of research activity at the beginning of the field (LaPlaca & Katrichis 2009, p. 10). Since then numerous new lines of B2B-research have emerged, enlarging the field of B2B-marketing to an extent where investigations based solely on B2B-publications are too limited in scope to draw an appropriate picture of the field (Roth & Gmür 2004, p. 142). Extra-disciplinary publications or authors, on whom B2B-researchers regularly draw, are not considered within literature reviews (White & McCain 1998, p. 328), but may play an important role in the evolution of the field. In this context the present paper will have a special focus on how certain publications and authors influenced the growth of the field of B2B-marketing, thus enhancing the prior research based on literature reviews, which are not capable of such an assessment.

For a more in-depth analysis of the structure and evolution of B2B-Marketing, the present paper applies the bibliometric methods, citation analysis and co-citation analysis, for the first time to this particular subfield of marketing. To date there have been only a few bibliometric studies on the subject of marketing, the first being Hamelmann & Mazze (1973), who investigated the citation patterns between the *Journal of Marketing* (*JM*) and *Journal of Marketing Research* (*JMR*) and other selected business and economics journals. A number of subsequent studies continue the examination of the field of marketing (e.g. Goldman 1979, Jobber & Simpson 1985, Tellis et al. 1999), yet the only marketing-subfields primarily investigated are advertising and consumer research (Cote et al. 1991; Hoffmann & Holbrook 1993; Pasadeos et al. 1998; Pasadeos & Renfro 1985). The studies dealing with the latter were also the first to alter the unit of analysis within their citation analysis from journals to a single article and to conduct the first author co-citation analysis within the whole area of marketing research (Cote et al. 1991; Hoffmann & Holbrook 1993). Furthermore only two other co-

citation analyses in the field of marketing are known to the authors to date (Pasadeos et al. 1998; Roth & Gmür 2004). Therefore the present paper will extend the usage of this type of analysis within the subject of marketing but with a distinctive focus on the yet uninvestigated subfield B2B-marketing. For this purpose citations of B2B-articles from general marketing journals and the three leading B2B-journals *IMM*, *JBIM* and *JBBM* will be investigated in four multi-year periods (1972-1978, 1987-1991, 1998-2000, 2007-2009). The mentioned B2B-journals have so far only been included in a study of 49 other marketing and marketing-related journals, where each journal's influence based on the number of citations it receives from the other journals was assessed (Baumgartner & Pieters 2003). The results show, that *IMM* is the tenth most influential journal in marketing, which underlines the importance of the field for marketing research and explains its need for focal examination.

Consequently the goals of the paper are twofold: (1) The first objective is to detect the most influential publications and journals within the field. For this purpose a citation analysis is used to determine the amount of citations a particular paper or journal receives (Culnan 1986, p. 158; Smith 1981, p. 88). (2) The second objective is to identify the main research fronts of B2B-marketing and their interrelation from the view of its members. Hereto the co-citations between the most influential authors are measured and visualized by mapping clusters of co-citees (Small 1973, p. 265; White & Griffith 1981, p. 163). These can be identified with certain subject areas or research specialties within the field of B2B-marketing, among them is the Industrial Marketing and Purchasing (IMP)-Group (McCain 1990, p. 433). In contrast to literature reviews this kind of analysis is capable of revealing the interrelations of different schools of thought and possesses a higher objectivity since it is the outcome of a composite judgment of a large number of citing authors (Bayer, Smart & McLaughlin 1990). Therefore this type of analysis does not influence its outcome, as the allocation of authors to research areas is not based on the subjective views of the authors of the study (Ramos-Rodriguez & Ruiz-Navarro 2004, p. 981).

The results can be used to investigate further research questions, such as whether a diversification or concentration of the discipline has taken place during the last decades. An additional focus of the present paper will be on the development of the IMP-Group and its dominant school of thought the network approach (Wilkinson 2001). As the IMP-Group and its members have contributed significantly to research within the field of B2B-marketing, it is worth studying their influence on its evolution, based on the citations their numerous publications have received (Turnbull et al. 1996, p. 45). Additionally the clusters of IMP-Group members will be particularly addressed within the derived co-citation networks in order to disclose the interrelation of IMP-related research with other research areas within the field of B2B-marketing. The internal structure of these clusters serves as a basis for detecting the perceived affinity between the most-cited IMP-Group members, which can be compared to findings about the internal structure of the IMP-Group by Morlacchi et al. (2005). In their study a co-author-analysis based on IMP conference papers was used to show the research collaboration and links between its members. The applied n-clique analysis reveals a core network of 57 researches, which will be compared to the upcoming co-citation networks in order to reassess which members are also present there.

RESEARCH METHOD AND DATA

METHOD

Citation analysis and co-citation analysis, which are both employed in this paper, are bibliometric methods that have been widely used to empirically investigate the structure and scholar activity of various disciplines (Üsdiken & Pasadeos 1995, p. 508). The basic assumption of the citation analysis is that citations show the existence of a certain influence of the cited paper on the citing paper (Culnan 1987, p. 342). Thus the sum of citations on a certain paper, author or journal from a representative sample of literature, is an acceptable surrogate of its influence on the corresponding research subject or field (Culnan 1986, p. 158). In order to be able to compare the four periods investigated a citation value (CV) is calculated, which is the relation of the individual amount of citations to the total number of citations in one period. Since articles are normally cited once in an article[1] the denominator for this unit of analysis is equal to the total number of investigated articles. For authors or journals the total number of citations is equal to the sum of all references, because multiple citations are possible in this case. Since these multiple citations to authors from one article may distort the assessment of their influence, only authors, where the number of citing articles is at least 30% of the sum of their received citations, are included (following Waugh & Ruppel 2004, p. 280). For instance the author *Locke* was eliminated in the first period as his twelve citations result from only two articles. In total five (9,17,27) authors were excluded from the analysis in the first (2nd, 3rd, 4th) period. In all calculations self-citations were not completely omitted (Üsdiken & Pasadeos 1995, p. 511), but weighted with a count of 0.5 in order to limit the loss of information accompanying their elimination (Glänzel & Thijs 2004, p. 282).

The additionally applied co-citation analysis is a form of bibliometric network analysis, which, following the argumentation of White (1990) and McCain (1990), has the purpose to study and visualize the 'intellectual structure of scholarly fields'. It records the frequency of two authors being cited together by one citing sample paper in order to detect their perceived affinity (Small 1973, p. 265). Based on the consensual judgment of the citing authors, the clusters of closely related co-cited authors are identified, which epitomize certain subject areas, research specialties or schools of thought within the discipline (McCain 1990, p. 433). It can be interpreted as the field's view of itself and consequently is an appropriate means of exploring the intellectual structure of a scientific discipline (White & Griffith 1981, p. 163). Numerous studies have validated the results of the co-citation analysis and showed that the detected structure corresponds to a large extent with the judgment of involved researchers or other experts such as research price committees (c.f. for citation analysis: Gordon 1982; Summers 1984; Wade 1975; for co-citation analysis: Lenk 1983; McCain 1986; Mullins et al. 1977; Small & Greenlee 1980).

For the determination of the co-citation clusters numerous possible methods are available, which differ mainly in terms of the applied similarity value. Possible values are for instance absolute co-citation counts, Pearson's correlation co-efficients or factor loadings (Nerur et al. 2008; Small & Griffith 1974; White & McCain 1998). According to the research objectives of the present paper, a method introduced by Gmür (2003) was chosen, which, compared to other methods, leads to especially well-balanced networks with distinctive clusters. For the unit of analysis, the single author was selected, so that in order to reduce the complexity of investigation the study focuses on the approximately 300 most-cited authors in each period (Chen & Paul 2001). This number has proven to be sufficient in similar studies to identify the five to ten most influential lines of research per period (Meyer et al. 2006). The threshold for authors to be included in the analysis was a citation value of 0.05%, which was

[1] Negligible exceptions are different editions of a single monograph.

kept the same throughout the four periods for means of comparison. The number of authors remaining for the three periods are 367 (1972-1978), 333 (1987-1991), 333 (1998-2000), 281 (2007-2009). In his study Gmür (2003) has shown, that the absolute co-citation counts between these authors are not suitable for generating clearly defined clusters, therefore a relative co-citation value, the CoCit-Score, was used as the measure of similarity between authors A and B. Here the absolute co-citation count is put in relation to each author's individual citation counts with greater weight conferred to the smaller of the two:

$$[1]\ CoCit_{AB} = \frac{(Cocitation_{AB})^2}{Minimum\ (Citation_A : Citation_B)\ \times Mean\ (Citation_A : Citation_B)}$$

Hence two sparsely cited authors (both cited 40 times) with an equal absolute co-citation count (20 co-citations) compared to two heavily cited authors (both cited 100 times) with similar absolute values will receive a higher CoCit-Score (0.25 vs. 0.04) since it can be assumed, that they are more closely related in content. The CoCit-Score is scaled to a range between 0 and 1, meaning that multiple citations and co-citations of authors within one reference list are just counted once. Only the co-citation relationships above the threshold-value of 0.225 for all periods and with a minimum of three absolute co-citations were selected for further investigation. These were visualized in UCINET 6 (Borgatti et al. 2002) with the authors as nodes and the lines between them representing the respective co-citation relationships. The closeness of the authors in the maps is algorithmically related to their perceived affinity; however authors only linked to one other author, so called isolates, were eliminated before visualization. For the detection of clusters within the resulting co-citation networks the *Fruchterman-Reingold-Spring-Embedded Algorithm* was primarily used, additionally the results were verified by a single-linkage cluster analysis (Fruchterman & Reingold 1991, p.1131). In general only groups with at least four authors that are linked by at least five strong co-citation relationships are considered to be a cluster.

DATA

The data used for the analysis was taken from the ISI Web of knowledge, the online citation database of Thomson Reuters. Among others it includes the Science Citation Index (SCI), the Arts & Humanities Index (A&HI), and the Social Science Citation Index (SSCI), which were all originally founded by the Institute of Scientific Information (Garfield 1979a, p. XI). Especially the SSCI was used for data gathering in the present paper, as the population consists of the bibliographies of 1,392 B2B-articles[2], which were published in the B2B-journals *IMM*, *JBBM* and *JBIM* and in the leading marketing-journals (MJ) according to Theoharakis & Hirst (2002). The selection of the B2B-journals is based on the consideration, that they are frequently characterized as the leading journals of the field and together cover a wide range of both applied and theoretical research issues (LaPlaca 2008, p. 180; Lichtenthal & Mummalaneni 2009, p. 51). Following LaPlaca (2008) all articles from these journals are included in the investigation, whereas articles in the selected general marketing-journals are classified as B2B-related if in their *title*, *abstract*, *author keyword* or *keyword plus* at least one of the following keywords is present: *Buyer-Seller*, *Business Relation**, *Product Development*, *Buy* Behav**, *Supplier Relation**. In order to prevent B2C-articles being among the results at least one of the following B2B-synonyms must be present as well: *Organization**, *Industrial Market**, *B2B*, *Business-to-Business* oder *Business Market**[3](LaPlaca 2008). On the whole only articles with a dedicated research contribution are included, thus letters-to-

[2] Due to the fact, that the JBBM and JBIM have not been listed in the SSCI in all time periods, 188 articles with 6,393 references published in these journals were manually collected.

[3] The truncation symbol (*) allows different endings of the words to be included in the search results.

editor or book reviews were omitted. In order to allow a longitudinal study of the evolution of B2B-marketing, the time frame was divided into four periods. Each of the periods is required to have a minimum length of approximately three years, the distance between periods was set to a minimum of at least six years in order to reduce random short-term variations (van Raan 1996, p. 403).

As a starting point the year 1972 was chosen as it marks the beginning of a period of substantial growth within the discipline (Reid & Plank 2000, S. 9). For the purpose of creating comparable periods at least 200 B2B-articles need to be available and suitable for investigation. This requirement led to an enlargement of the first two periods due to the following reasons: First, the number of annually published B2B-articles between 1972 and 1991 is, in terms of quantity, on a considerably lower level compared to the subsequent periods, where additional publication outlets were introduced. Second, a significant proportion of the existing articles has not cited any article at all and as a matter of course cannot be included in the study. Further analysis of those articles show, that most of them are case-related studies, which, due to their applied focus, abdicate the use of references and thus reflect the case research tradition of B2B-marketing in the early stages of its development (Lichtenthal & Mummalaneni 2009, p. 53). Concerning the references, all cited sources were removed if they did not specify an author. This is especially the case in statistical documents, publications by institutions or popular magazines. The final database is displayed in the following table M1.

Table M1. Database

		1972 - 1978	1987 - 1991	1998 - 2000	2007 - 2009	Total
Results of database search						
Published articles		***294***	***299***	***367***	***562***	***1522***
articles without references	IMM	76	10	1		87
	JBIM		25		1	26
	JBBM			1	2	3
	MJ			6	7	14
Included articles and references						
Suitable articles		***218***	***263***	***359***	***552***	***1.392 (100%)***
articles of database	IMM	207	185	139	212	743 (53.38%)
	JBIM		62	84	132	278 (19.97%)
	JBBM			42	43	85 (6.11%)
	MJ	11	16	94	165	286 (20.55%)
Number of references		***2.381***	***4.493***	***15.955***	***32.454***	***55.283 (100%)***
corresponding references	IMM	2.250	3.271	5.223	13.446	24.190 (43.76%)
	JBIM		715	3.090	6.363	10.168 (18.39%)
	JBBM			2.588	1.714	4.302 (7.78%)
	MJ	131	507	5.054	10.931	16.623 (30.07%)

Before analyzing the data, it was semi-automatically checked for consistency and input errors, such as misspellings of names or missing volume or page numbers, were corrected. Moreover, different editions of a single monograph were updated to the most recent one in each period and modifications in journal titles recorded to the best of our knowledge. Also (very) similar author names were checked manually for homonyms in order to prevent biases in the results.

RESULTS

CITATION ANALYSIS: EXPLORING THE DEVELOPMENT OF B2B-KNOWLEDGE GENERATION AND TRANSFER PROCESSES

The citation analysis answers the question of how dynamically B2B-knowledge is generated and transferred over time (e.g. Osareh 1996). In order to evaluate these knowledge transfer processes we investigated (1) the citing behavior, (2) the origin of the references cited and (3) the characteristics of the key references.

Firstly, the average number of citations serves as an indicator for the dynamics and the state of a discipline's development. Table M2 shows that the average number of references per article increased steadily from 10.92 for the period 1972-1978 to 58.53 (+436%) for the period 2007-2009. This finding is consistent for the B2B-journals as well as the major marketing journals. This considerable increase leads back to the growth of the B2B-specific knowledge base that stimulates and differentiates onward knowledge generation. Furthermore, the expansion of electronic data bases considerably facilitated both the acquisition and diffusion of B2B-knowledge, which explains the disproportionate increase between the period 1987-1991 and 1998-2000 (+144%). In contrast, the aging of the references cited implies a stagnation of the discipline's evolution. The average age of the references went up from 7.64 to 13.02 (+70.4%). However, due to the emergence of 'classics' that have a long-term impact on a discipline's knowledge base, these aging effects are considered to be common for the nature of a scientific discipline. The self citation ratio represents another indicator for exploring the research dynamics of a discipline. Due to the lack of alternative references, authors from young research areas more often tend to cite themselves than authors from established research areas (Garfield 1979a; Porter 1977). Taking this into account, the decrease of the self-citation ratio from 6.88% for the 1st period to 2.99% for the 4th period supports the maturation of B2B-Marketing as a scientific discipline.

Table M2. Citing Behavior

	Period			
	1972-1978	1987-1991	1998-2000	2007-2009
Average number of references	10.92	17.15	41.86	58.53
Average age of references (years)	7.64	8.80	11.19	13.02
Self reference ratio	6.88%	5.36%	4.15%	2.99%

Secondly, the origin of the references cited helps to evaluate the knowledge transfer and generation processes. From the period 1972-1978 to the period 2007-2009, the influence of journals for the knowledge generation process increased constantly from 46.28% up to 78.71% (see Table M3). However, this development reflects the general importance of scientific journals for the knowledge generation process, not only in B2B-marketing. Although the importance of journals grew over time, we identified three journals that have a major impact on B2B-marketing. The *JM* (9.83%), the *JMR* (4.85%) and the *IMM* (4.50%) influence B2B-marketing the most. In the three latest periods, approximately one out of five citations came from one of these three journals. It is reasonable to assume, that the high reputation and broad thematic focus of the two general marketing journals favored their leading positions within the ranking. Compared to the other specialized B2B-journals of the study (*JBIM*: 0,96%; *JBBM*: 0,42%) the *IMM* is clearly the leading B2B-research outlet. This can be partly explained by its comparatively longer publication history (*JBIM* since 1986; *JBBM* since 1993) and the resulting first-mover advantage. Interestingly, psychologically oriented journals like the *Journal of Applied Psychology* (0,63%) and *Psychological Bulletin* (0,45%) only have

minor impact on B2B-research. Therefore, the influence of psychological research that Johnson (2006) found to impact general marketing research does not apply for the B2B-discipline.

Table M3. Origin of References

	Period			
	1972-1978	1987-1991	1998-2000	2007-2009
References from journals	46.28%	67.35%	70.35%	78.71%
Top 3 journals cited				
	JM (6.76%)	IMM (8.72%)	JM (10.05%)	JM (10.07%)
	JMR (5.00%)	JM (8.21%)	JMR (4.86%)	IMM (4.69%)
	HBR (5.74%)	JMR (4.87%)	IMM (4.20%)	JMR (4.52%)
	All periods: JM (9.83%), JMR (4.85%) IMM (4.50%)			
Abbreviations: JM = Journal of Marketing, JMR = Journal of Marketing Research, HBR = Harvard Business Review				

Thirdly, we looked at the characteristics of key references. The identification of each period's most-cited publications reveals the driving scholars as well as the key subjects of a discipline at a certain point in time. Following the scope of this paper, we explicitly looked at IMP-related publications. The tables M4 and M5 list the ten most-cited publications of each period together with the most-cited IMP-related publications[4] outside the top ten. As can be seen from the tables, the dynamics of the scientific development in the field declined over time. For instance, no publication appears in more than two periods. In addition, besides the books published by *Kotler 1976*, *Robinson et al. 1967* and *Webster et al. 1972a*, the first three periods contain innovative references without exception. That is, none of these publications are ranked among the top ten in one of the preceding periods. In contrast, in the period 2007-2009 six out of ten references also appear in the 1998-2000 period.

Table M4. Key References (1)[5]

1972-1978			**1987-1991**		
Rank	**Author**	**CV**	**Rank**	**Author**	**CV**
1	Robinson et al. 1967	11.93%	1	Kotler 1976 (3)	11.79%
2	Webster et al. 1972a	10.01%	2	Ames et al. 1984	6.08%
3	Kotler 1976	7.80%	3	Robinson et al. 1967 (1)	5.32%
3	Sheth 1973	7.80%	4	Porter 1980	4.94%
5	Buckner 1967	5.05%	5	Hutt et al. 1989	4.56%
5	Green et al. 1975	5.05%	5	Webster 1984	4.56%
7	Webster 1965	4.13%	5	Webster et al. 1972a (2)	4.56%
8	Cardozo et al. 1971	3.67%	**8**	**Johnston et al. 1981**	**4.18%**
8	Cyert et al. 1963	3.67%	8	Webster et al. 1972b	4.18%
8	Howard et al. 1969	3.67%	8	Wind 1974	4.18%
Most-cited IMP-related publications (outside the Top 10)					
249	***Hakansson et al. 1975***	***0.69%***	***39***	***Narus et al. 1986***	***1.90%***

[4] To be considered as an IMP-related publication, the publication needs to have an IMP-Member as the first author and deal with an IMP-Topic such as relationships, interactions and networks within industrial transact tions.

[5] Marking within table M4: Bold = Author is IMP-Member / Bold and italic = Author is IMP-Member and content of publication is IMP-related.

			60	***Hakansson 1982***	***1.52%***
			200	***Turnbull 1982***	***0.95%***
			209	***Spekman 1977***	***0.76%***
			209	***Ford 1984***	***0.76%***

The key references analysis also provides evidence for a change in the addressed subjects. While *Buying Behavior* and marketing 'classics' like Porter's *Competitive Strategy* dominate the two initial periods, a shift towards *Relationship Marketing*, especially *Buyer-Seller-Relationships*, can be observed for the 3rd and 4th periods. Furthermore, these periods feature an increasing interest in statistics and methodological foundation (e.g. Anderson 1988; Nunnally et al. 1994). The shift towards *Relationship Marketing* also reflects the growing influence of IMP-related publications. In the period 1972-1978, IMP-related publications impact the B2B-literature on a low level. That is, the top IMP-publication is ranked 249 (Hakansson et al. 1975). In contrast, the influence of IMP-publications significantly increased in the period 1998-2000 as well as in the period 2007-2009 (e.g. Anderson 1988; Anderson et al. 1990; Hakansson 1982).

Table M5. Key References (2)[6]

1998-2000			**2007-2009**		
Rank	**Author**	**CV**	**Rank**	**Author**	**CV**
1	Dwyer et al. 1987	15.88%	1	Morgan et al. 1994 (2)	22.55%
2	Morgan et al. 1994	15.04%	2	Dwyer et al. 1987 (1)	19.20%
3	Armstrong et al. 1977	10.86%	3	Fornell et al. 1981	16.30%
4	***Anderson et al. 1990***	***9.75%***	4	Armstrong et al. 1977 (3)	15.76%
5	Ganesan 1994	9.33%	5	Yin 2003	15.04%
6	Nunnally et al. 1994	9.19%	6	Nunnally et al. 1994 (6)	13.77%
6	Webster 1992	9.19%	**7**	**Anderson 1988**	**13.59%**
8	***Hakansson 1982***	***8.08%***	***7***	***Anderson et al. 1990 (4)***	***13.59%***
8	Pfeffer et al. 1978	8.08%	9	Ganesan 1994 (5)	11.18%
10	Williamson 1985	7.80%	10	Doney et al. 1997	10.33%
Most-cited IMP-related publications (outside the Top 10)					
15	***Hakansson et al. 1995***	***7.10%***	***13***	***Hakansson et al. 1995***	***8.69%***
21	***Anderson et al. 1994***	***6.13%***	***26***	***Anderson et al. 2005***	***6.89%***
25	***Hallen et al. 1991***	***5.57%***	***26***	***Hakansson et al. 1982***	***6.89%***
36	***Ford 1997***	***4.74%***	***32***	***Ford et al. 2003***	***6.16%***
55	***Anderson et al. 1984***	***3.76%***	***34***	***Anderson et al. 1994***	***5.98%***

CO-CITATION ANALYSIS: EXPLORING THE STRUCTURAL DEVELOPMENT OF B2B-KNOWLEDGE

Authors, whose works are perceived to be related, are frequently co-cited with each other and constitute corresponding clusters when mapped (Culnan (1986), p. 158). These clusters represent different research fronts within the field of B2B-marketing and will be identified and interpreted with regards to their content and applied methods in the following. By comparing the networks across the four periods, the co-citation analysis can answer the question of how B2B-knowledge structurally developed over time. For this purpose we will

[6] Marking within table M5: Bold = Author is IMP-Member / Bold and italic = Author is IMP-Member and content is IMP-related.

start with an overview of the size and composition of the research networks arising from the co-citation relations between the most-cited authors in each period. Afterwards each co-citation network is visualized and described according to its structure and content.

Size of research networks

Table M6. Size of research networks

		1972 - 1978	1987 - 1991	1998 - 2000	2007 - 2009
(1)	Authors included in co-citation analysis [CV > 0.05%]	367	333	333	281
(2)	Contingent number of co-cited author pairs [(1)x((1)-1)/2]	67.161	55.278	55.278	39.340
(3)	Actual number of pairs	4.455	6.781	27.837	26.128
(4)	Connectivity [(3)/(2)]	6.63%	12.26%	50.36%	66.41%
(5)	Pairs in network [CoCit-Score > 0.225 plus min. 3 absolute co-citations]	99	167	240	145
(6)	Authors in network	58	131	196	106
(7)	Eliminated isolates (share of (6))	24 (41.4%)	71 (54.2%)	71 (36.7%)	53 (50.0%)
(8)	Visualized authors [(6)-(7)]	34	60	125	53
[ ]=Treshold or Calculation					

From the first look it is obvious that from the first to the third period the number of co-cited author pairs (5) and authors (6 & 8) within each period's network increases steadily (cf. table M6). This development correlates with the growth of the discipline and indicates a rising research activity within the field of B2B-marketing. However in the last period (2007-2009) the number of authors and pairs declines significantly resulting in a considerable smaller research network. Initially this seems to suggest a concentration of B2B-research and stagnation in the dynamics of its development. Yet a more in-depth investigation of the data shows that the opposite is the case: The increasing number of citations per author between the last two periods (cf. table M7) is more equally distributed across the cited researchers, meaning that especially those authors previously moderately or rarely cited gain disproportionately high amounts of citations. As a consequence 52 top-cited authors suffer a reduction in their citation counts and do not exceed the CV of 0.05%.

Table M7. Citing behavior between 3rd and 4th period

	References	Cited authors	Ø- citation per author
1998 – 2000	15.955	5.946	2.68
2007 – 2009	32.454 (+103.4%)	9.880 (+66.2%)	3.28

Another, yet related, effect leading to the small size of the network is the increasing connectivity of the remaining authors compared to the previous period (4) (cf. table M6). Here the authors are co-cited with a growing number of other authors, leading inevitably to an increase in their individual citation counts, which presumably in some cases grows stronger than the co-citations of the existing relationships. Consequently the CoCit-Score of 37 authors decreases to a level under the threshold of 0.225, explaining another part of the reduc-

tion of the network size by 90 authors in the period 2007-2009. In summary, the equal distribution of a growing number of citations together with the growing connectivity between authors leads to a decrease in network size. Hence, on second sight, the network structure of the last period shows a widening of the B2B-marketing research basis rather than its concentration. However, due to the chosen thresholds this development was not visualized.

Composition of research networks

In order to assess the composition and structure of the identified research networks we draw on the three measures *Size, Ties* and *Pairs*, which are frequently used in Social Network Analysis (for further details see van den Bulte & Wuyts 2007; Wasserman & Faust 2007). These figures are calculated for each author (including isolates) within the network and characterize the role and position a focal researcher incorporate. They are summarized across the respective authors of each period in Table M8 and calculated as follows: *Size,* is the number of other authors a focal author has a co-citation relationship with. Those authors, who are directly linked through co-citations to the focal author, form his ego network (Wasserman & Faust 2007, S. 53). Consequently the derived research networks consist of a series of ego networks, where *Ties* is the number of actual links and *Pairs* is the number of contingent links between all authors (nodes) within a specific ego network (Morlacchi et al. 2005, p. 13).

Table M8. Ego network measures

		1972 - 1978	1987 - 1991	1998 - 2000	2007 - 2009
Size	Mean	3.38	2.53	3.27	2.72
	Standard deviation	3.32	2.1	2.52	2.46
Ties	Mean	3.57	1.76	2.39	2.09
	Standard deviation	5.9	3.29	4.15	4.09
Pairs	Mean	9.45	4.13	6.85	5.34
	Standard deviation	23.55	8.63	12.81	12.8

The results show that the research networks of the periods 1987-1991 and 2007-2009 are characterized by authors with comparatively few co-citation relationships (*Size*) and ego-networks with only a few links between the respective authors (*Ties*) (cf. table M8). This leads to the conclusion that isolated pairs, two authors only co-cited with each other, or co-citation chains, a string of co-citations with no significant cross links, occur notably more often in these two periods, thus indicating a less concentrated research field (Gmür 2003, p. 32). Since such pairs and chains are according to the requirements for a cluster irrelevant for the clustering routine, they are eliminated before. This explains the high rate of elimination (7) in these two periods (cf. table M6). In the first period the high value of the measure *Pairs* is suggestive of multiple connected ego networks, which result in rather large clusters of co-cited authors when mapped.

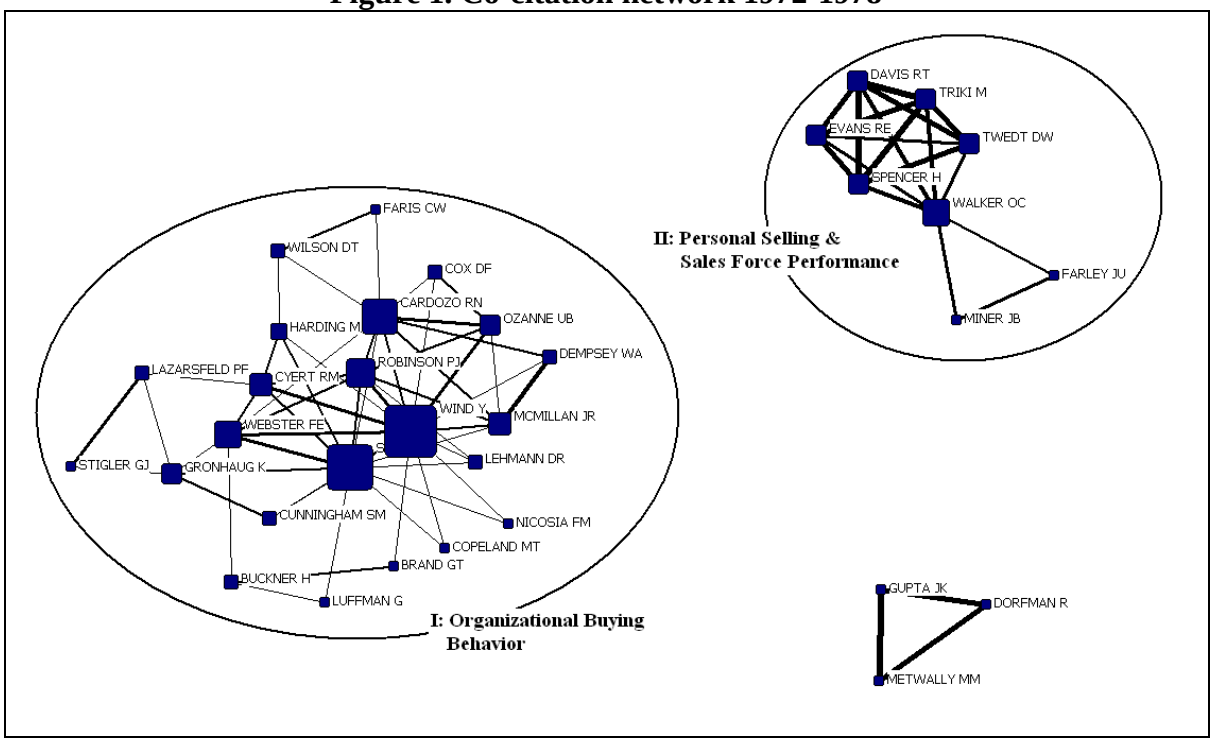
In general the size of a cluster, measured by the number of its authors, serves as an indicator for the significance of the corresponding research field. Its density, defined as the relation of the number of actual and possible links between the authors, shows the proximity of the authors and the cluster's coherence (Gmür 2003, p. 33). In the networks illustrated in figures 1 to 4, the relative size of the nodes shows the centrality of the respective author as it increases in relation to the number of other authors co-cited with the focal author. A large node additionally means that the respective author's works plays a major role within the topical orientation of the cluster. Thus it often serves as a starting point for detecting the cluster's thematic points of focus and is examined along with the other author's basic sources. Those authors, who have already appeared in the previous period's map, are distinctively marked by

grey rhombuses. The lines between the authors represent the co-citation relationships with a minimum CoCit-score of the threshold-value 0.225. Similar to the nodes, thicker lines go along with higher CoCit-scores and thereby closer relationships between the co-cited authors.

Co-citation network 1972-1978

The first co-citation network comprises 34 of the 367 most-cited authors of the period and therefore the fewest authors of all periods. It consists of two clusters and one triplet, which are all unconnected.

Figure 1. Co-citation network 1972-1978



Cluster I is considerably larger in size than cluster II and consists of 23 authors. Despite its rather low density of 22.12%, it has a distinctive topical focus, which is *Organizational Buying Behavior*. In this context the majority of the included authors analyze the characteristics of the buying decision making process within organizations, for example structure, size and type of the buying center. The cluster's dominant authors are *Cardozo, Sheth, Wind, Webster* and *Robinson*, the latter representing different attempts for developing structural models of buying behavior (Robinson et al. 1967; Sheth 1973; Webster & Wind 1972). Consequently the focus at that early stage of *Organizational Buying Behavior* research was the conceptual development of a better understanding of the observed buying processes leading to a large amount of subsequent research questions or the need for more programmatic testing of the proposed models (Reid & Plank 2000, p. 44). The size of the cluster and the fact, that all of the central authors are also in the top ten list of the most-cited articles in this period with at least one of their publications (cf. table M4) signifies the outstanding role this field of research played for B2B-researches from 1972-1978.

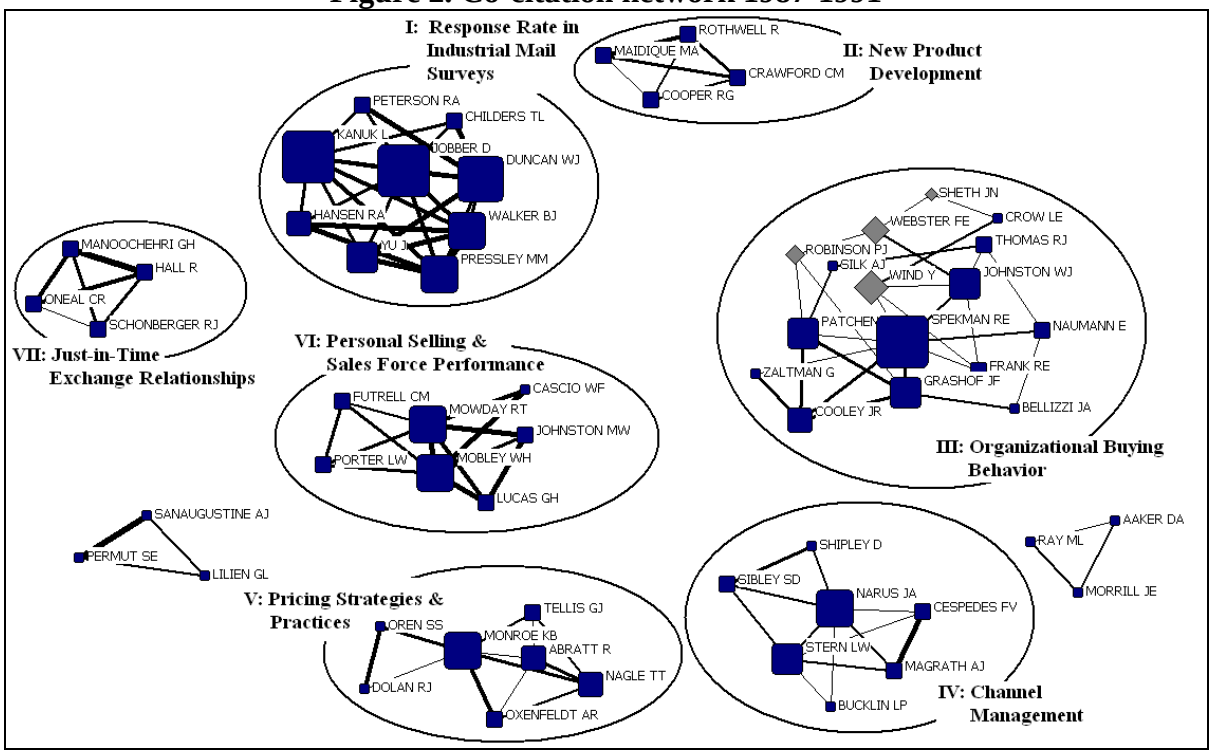
The second cluster (II) is, in terms of size and density, the opposite of cluster I. It contains only 8 authors; however the high density of 64.28% and the high CoCit-scores reveal a very homogeneous scientific orientation. The topical focus is on *Personal Selling & Sales Force Performance*, in which especially the characteristics and success factors of personal

interaction within the sales process are analyzed. For the structure of the cluster *Walker* functions as a kind of gatekeeper that connects *Miner* and *Farley* with the core-cluster, as they have a more distinctive focus on industrial selling situations as the other authors.

Co-citation network 1987-1991

Compared to the previous network there are more authors and clusters in the network of the period 1987-1991, which indicates the general growth of B2B-research activity in the 1980s and the slightly more differentiated structure. The corresponding network includes 60 authors spread over seven clusters and two triplets. Attributing these clusters to lines of research shows that the two topics *Organizational Buying Behavior* (III) and *Personal Selling & Sales Force Performance* (VI) can be found again in this period, but with mostly different authors in their clusters. Consequently these research areas were developed further by new upcoming researchers, who replaced the previously dominant authors. Concerning cluster III this is the case for *Webster*, *Wind*, *Sheth* and *Robinson*, all central authors in the first period, which are still present in the subsequent cluster, but in less prominent positions.

Figure 2. Co-citation network 1987-1991



The present cluster III continues the line of research of *Organizational Buying Behavior*, but with a wider topical focus. According to the works of the 12 new authors the concept of the buying center becomes more important in the scientific discussion. Especially the identification of the composition of the buying center, process issues and the ties between its members are approached by different authors. One of them is the heavily co-cited author *Spekman*, who like *Johnston* later joined the IMP-Group. Another research direction in this cluster is pursued by authors like *Wind* and *Frank*, who deal with segmentation issues in B2B-markets. On the whole, according to the size of cluster III, *Organizational Buying Behavior* as a field of research has once again a significant influence on B2B-researchers in the period 1987-1991.

In cluster VI the change of authors was even more drastic since none of the authors of the first period (cluster II) are present anymore. Such a fluctuation reflects the research dy-

namic accompanying this time period and leads to a change in the research objectives within the major topic *Personal Selling & Sales Force Performance*. The seven authors of the present cluster deal primarily with issues of employee fluctuation in the sales force and examine the influence of organizational and personal factors on the satisfaction and loyalty of sales personnel.

All other clusters in the network are formed for the first time. Among them the largest and most homogeneous is cluster I, in which the central theme is market research through questionnaires. This topic is particularly relevant for B2B-marketing, because in contrast to B2C-marketing, data for more programmatic research is not that easily accessible and limited to a small number of information sources. Thus the nine authors of this cluster describe and analyze how the *Response Rates in Industrial Mail Surveys* as the most important information source can be maximized.

Cluster II consists of only four authors, which is, based on the requirements of the clustering routine, the smallest possible size of a cluster. The cluster's focus of interest is on *New Product Development*, especially the factors that determine success or failure of innovations. Although the positioning within the cluster does not allow a conclusion on one central author, Reid & Plank (2000) award *Cooper* the biggest influence in this field.

When assessing the lines of research of cluster IV by scanning the main publications of its seven authors, it becomes obvious, that they deal with three related research objectives all belonging to the field of channel and distribution management in B2B-markets. The issues addressed are (1) how to control and motivate industrial distributors, (2) which kind of relationship is appropriate in collaboration with distribution partners and (3) how to choose and design adequate distribution channels. The central authors of this cluster in terms co-citedness are *Stern* and *Narus*, who can be associated with the subfields (1) and (2). Narus is also a member of the IMP-Group.

The central author of cluster V is *Monroe*, who deals, like the remaining six authors of this cluster, with pricing issues as a part of the marketing-mix in the B2B-selling process. In addition to the choice of an adequate pricing method, more strategic issues within pricing decisions like product line pricing are also analyzed in this line of research.

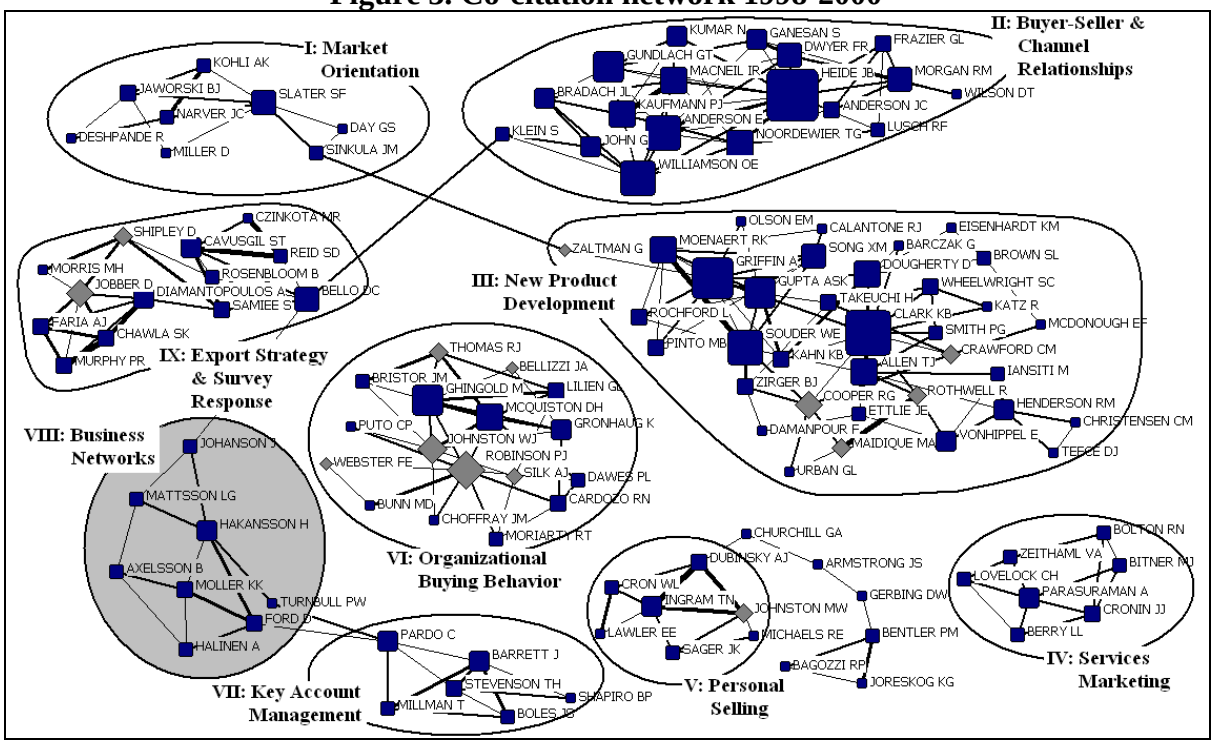
Cluster VII is another cluster in the period of 1987-1991 with the minimum size of four authors and shows comparatively high CoCit-scores between its members. It is therefore a very homogeneous cluster with a topical orientation on *Just-in-Time Exchange Relationships*. In this context the coordination and synchronization of exchange relationships between buyer and seller in particular have been researched. The small size of the cluster underpins the statement of Frazier et al. (1988), that such concepts have so far rarely received attention in the marketing-literature.

Co-citation network 1998-2000

The co-citation network for the period 1998-2000 is the largest one of all periods including 125 authors, from which only 14 have already been present in the 3rd period's network. Since the large number of newly displayed researchers also deal with new lines of research, the topical structural of the focal period has changed considerably. For the first time, clusters are not isolated anymore, but connected via the co-citation relationships between particular members of them. For instance clusters II, VII, VIII and IX are interlinked and form a chain within the network. Regarding their research orientation, the four clusters with the exception of cluster IX, which lacks a distinctive topical focus, are clearly devoted to special research subfields related to the newly emerging topic of *Relationship Marketin*g. While in prior periods such subfields were represented by particular groups of authors inside one cluster, the scientific discussion in the third period has become so differentiated, that specialized research subfields possess a sufficient number of co-citations to form individual clusters.

Since these clusters are still, to some extent, related in content, linkages between them can be found in the corresponding co-citation networks. At this point it becomes obvious, that the underlying structure of B2B-marketing research has changed over time, indicating an increasing diversification of the whole discipline. The influence of the IMP-Group on this evolution process is visualized for the first time in the present period since one of the four clusters mentioned above was composed solely of IMP-Group members.

Figure 3. Co-citation network 1998-2000



Concerning the lines of research within the network at hand, *Relationship Marketing* as a research paradigm for business markets is the dominating topic. In contrast to former B2B-research not the discrete transaction, but the establishment of long-term business relationships between the transaction partners is the subject of investigation (Little & Marandi 2003, p. 1; Mattson 1997, p. 449). This is due to the fact that the majority of transactions in industrial markets is connected and builds upon each other, which results from the corresponding unique market characteristics such as a limited number of industrial buyers and sellers or heterogeneous demand and supply (Mattson 2004, p. 177). Consequently the understanding of the characteristics of buyer-seller relationships is especially important in business markets and thus the topical focus of cluster II (*Buyer-Seller & Channel Relationships*). This cluster is, with 18 authors, the largest of the four interlinked clusters and deals not only with *Buyer-Seller Relationships*, but also with the design of long-term relationships with distribution partners. In this context some authors, like *Klein* for example, refer to transaction cost theory for theoretical foundation of their research.

The role and influence of the IMP-Group within B2B-research becomes obvious when analyzing cluster VIII, which consists of the IMP-member *Mattsson, Hakansson, Axelsson, Moller, Halinen, Ford, Turnbull* and *Johansson*. In terms of content, the eight researchers extend the analytic view on business market transactions from single dyadic buyer-seller relationships to multi-organizational networks of connected exchange relationships (Little & Marandi 2003, p. 2; Mattsson 2004, p. 177). Consequently together they represent the IMP's in-

teraction and network approach. The cluster itself can be characterized by a mean density of 42.85% and a relatively homogeneous author structure as no member is in a dominant position concerning the absolute number of co-citation relationships with other authors. With a CoCit-Score of 0.438 the strongest co-citation relationship can be located between *Hakansson* and *Ford*, who are also individually the most-cited, respectively influencing, authors of the cluster. Compared to the co-author-core-network ('57CoreNet') of Morlacchi et al. (2005), in which from the 8 authors only *Axelsson* is not present, there are certain similarities: *Hakansson* and *Ford* as well as *Mattsson* and *Johannsson* are directly connected to each other both through co-authorship and co-citedness. Moreover the hub role *Johansson* incorporates within the 57CoreNet, he also plays inside the co-citation network of the 3rd period. There he links the cluster VIII via the author *Bello* to cluster II *Buyer-Seller & Channel Relationships.* Since the latter predominantly deals with dyadic business relations, the IMP-approach can be seen as a topical enhancement, yet with a common research focus on industrial exchange relationships. Another related cluster, to which the IMP-Group member *Pardo* serves as a connector, is cluster VII, which deals with *Key Account Management* as a basis for long-term customer relationships. Since this cluster consists of only six authors, the IMP-cluster is the second largest of the three clusters dealing with relationship marketing issues. Therefore the B2B-authors of the period 1998-2000 draw substantially on the research output of the IMP-Group and its members.

Besides relationship marketing, the B2B-research of the 3rd period is heavily influenced by the topic *New Product Development* (NPD) since the corresponding cluster III is, with 35 authors, the largest cluster within the network. Compared to the previous period, where this line of research was represented by only four authors, the cluster size has almost nine-folded. This indicates the growth of research within this particular field and the growing importance of *New Product Development* in industrial markets, especially concerning specialty products (Backhaus & Voeth 2007, p. 211). Due to the large number of new researchers, like *Gupta, Griffin, Clark, Souder* and *Moenart*, the topical orientation of the cluster becomes more focused on the interaction between R&D and marketing and the opportunities and limitations of cross-functional development-teams (Reid & Plank 2000, p. 73). By the author *Sinkula* the cluster is connected to cluster I *Market Orientation*, whose eight authors deal with the inter-functional processing of market information in order to improve the adaption of a company towards consumer needs and other market conditions (Jaworski & Kohli 1993, p. 53; Jaworski & Kohli 1996, p. 120).

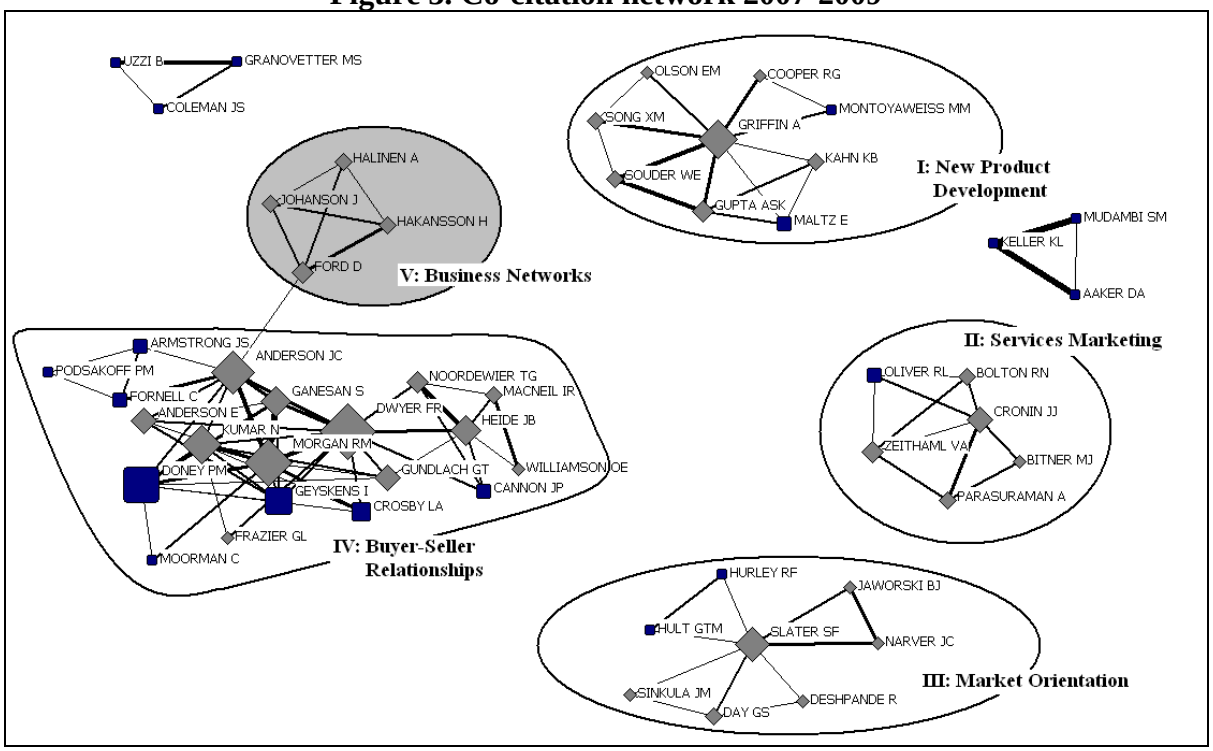
The remaining clusters are all isolated and comparatively smaller in size. Two of them, cluster VI and V, have been present since the first co-citation network 1972-1978 and thus have a long research tradition as well as a high importance for B2B-marketing. However the majority of the visualized authors appear for the first-time, so that the research dynamic within the clusters is still on a high level. *Robinson* in cluster VI can be viewed as an exception since he is co-cited exclusively with the book *Industrial Buying and Creative Marketing* from 1967, that has accordingly become a 'classic' of organizational buying behavior research (Pasadeos et al. 1998, p. 61). The newly developed cluster IV attributes to the topic *Services Marketing*. It is very coherent with a comparatively high density of 57.14% and has no dominant author. Important subfields are the measurement and conceptualization of service quality, predominately discussed by *Cronin* and *Parasuraman*.

Co-citation network 2007-2009

In the co-citation network of the 4th period a drop in the number of authors as well as clusters is noticeable. The reason as explained earlier is the increasing diversification of B2B-

research resulting in only 53 authors and five clusters being mapped. Since 34 of the authors in the clusters have not changed compared to the previous period, the five identified lines of research all continue topics, which have already been presented in the network of the 3rd period. This minor fluctuation of the topical orientation and composition of the clusters towards the last period of investigation indicates a decelerating research dynamic in the discipline of B2B-marketing, which is consistent with the results of the citation analysis.

Figure 3. Co-citation network 2007-2009



Special attention should be drawn to the fact, that after three consecutive periods no cluster dealing with organizational buying behavior is present in the network 2007-2009. Apparently authors dealing with this topic are not sufficiently co-cited anymore due to the declining research activity in this field compared to other B2B-research areas since the 1990s (La Placa & Katrichis 2009, p. 15). From the existing clusters only cluster IV *Buyer-Seller Relationship* and cluster V *Business Networks* are again connected due to their common orientation towards relationship marketing. Cluster IV consists of 20 authors, 12 of them from the corresponding cluster in the previous period, and is hence the largest cluster of the period. This underpins the high importance of the topic *Buyer-Seller Relationship* on the citing authors of 2007-2009. The continuous influence of IMP-related research on the field is expressed through the adjacent cluster V, which is made up of the IMP-Group member *Hakansson, Ford, Halinen* and *Johanson*. With only four authors, it is the smallest cluster of this period and only half the size of the corresponding cluster VIII of the previous period. Still its mere existence states, that the network-approach has consolidated preserved its position in B2B-research. The special marketing issues of services, including individual services as well as product-related services, are the topical focus of cluster II. Its authors are all heavily connected with each other (density: 66.66%) and, except for *Oliver*, have been part of the cluster since the previous period. Consequently the research orientation has remained mostly unchanged, yet a somewhat stronger focus on the analysis of the effects of services on customer satisfaction and loyalty can be observed. The two remaining clusters are both star-shaped with the central author *Griffin* (cluster I) and *Slater* (cluster III). Cluster I continues the re-

search field of *New Product Development*, whereas cluster III perpetuates *Market Orientation*.

CONCLUSION

Citations have been viewed by Cronin (1998, p. 48) as 'frozen footprints in the landscape of scholarly achievement', which reveal the interaction patterns among researchers and thereby offer evidence of a discipline's structure (Üsdiken & Pasadeos 1995, p. 508). Concerning B2B-marketing a small number of studies have described the state and evolution of B2B-Marketing, but there is no study that used the large amount of citation data available for this purpose. In order to enhance prior research and to assess the intellectual structure of B2B-marketing through a different perspective, the present paper applies bibliometric methods for the first time to this particular research field.

Regarding the first research question, the findings of the citation analysis reveal a picture of B2B-marketing, which is characterized by a continuously growing research field due to an increasing number of cited publications and authors. The initially low age of sources and the high fluctuation within the ranking of the most-cited articles per period show a highly dynamic field with short research cycles in the first periods of the analysis. Among the cited works Robinson et al. (1967) and Webster & Wind (1972) develop as 'classics' that constitute the basis of the field. Over time citations on these publications decline relatively as the thematic differentiation of the discipline increases and such basic concepts become universally accepted (Ramos-Rodriguez & Ruiz-Navarro 2004, p. 999). Instead other works, such as Morgan & Hunt (1994) or Dwyer et al. (1987), with a more distinctive research focus are heavily cited and contribute to the coming of age of the discipline. The increasing maturity goes hand in hand with a reduction in research dynamic as the most-cited articles in the last two periods are mainly similar. Moreover the growing usage of articles from journals and the decreasing amount of self-citations, which are usually common in younger disciplines, can be viewed as supporting evidence for the maturation in this area. The subsequent co-citation analysis answers the second research questions by detecting and comparing the different research fronts of B2B-marketing in each period of investigation. Here it becomes obvious, that the growth of the discipline and its changing research dynamic, already detected by the citation analysis, are also reflected in the size and the composition of the co-citation networks: A growing number of authors and clusters until the last period and a decreasing fluctuation of cluster members and topics are evidence for this particular structural development and an increasing differentiation of B2B-marketing research. Even the declining number of clusters between the 3rd and 4th period supports this assessment because contemporary researchers tend to deal with more and more specialized research issues (Engelhardt 1998, p. 26) resulting in insufficient co-citation relationships for building the corresponding research clusters. Moreover deviations in the topical orientation of the articles in B2B-journals and general marketing journals may increase the observed trend for diversification of the discipline. Since articles in one particular group of journals may focus on a different set of topics and therefore references, such issues possibly do not manifest themselves in the results of a cross-journal citation analysis. Especially since the share of B2B-articles from general marketing-journals increased to 30% of the data population by the last period, it can be assumed, that only bipartisan research fields have enough citations to be revealed by the citation analyses.

Looking at the topical breadth of B2B-marketing it becomes obvious, that in compliance with the findings of LaPlaca & Katrichis (2009) and their publication analysis, *Personal Selling* and *Organizational Buying Behavior* represent the initial research foci of the discipline. Over time, newly arising areas of interest such as *New Product Development* and

Market Orientation supplemented the field. However, only in the last twenty years did the interaction process between industrial transaction partners, as expressed by the period-spanning topics *Buyer-Seller Relationship* and *Business Networks*, become more dominant in the scientific discussion. Since the latter cluster is entirely made up of IMP-group members, it additionally stands for the growing influence of the group and its research approach on B2B-marketing research in the last two periods.

Inevitably, the findings of the present paper are limited by certain caveats that deserve to be mentioned. Such limitations result from the research design and the dataset on the one hand and from the applied bibliometric methods on the other hand. Concerning the dataset, the main drawback is that only the first-mentioned author of a reference is recorded in the ISI web of knowledge, which served as the source for the analyzed data. Consequently the influence of the other co-authors may be underestimated (Garfield 1979a, p. 242) and in the co-citation networks especially the relationships between more eminent researchers, who tend to appear first in the cited publications, are mapped (Gmür 2003, p. 28; MacRoberts & MacRoberts 1996, p. 438). Moreover orthographic errors, inconsistencies and homonyms, meaning two different authors who have the same surname and first name and can therefore only be distinguished by further investigation (Baker 1990, p. 7; Smith 1981, p. 92), were encountered during the data collection. In this context Baird & Oppenheim (1994) estimate, that approximately 20% of the records within the ISI database are erroneous, so that in order to prevent possible bias the dataset at hand was thoroughly checked and corrected. Among the drawbacks of the research design is the selection of the B2B-articles, of which the reference lists were analyzed. Since we choose B2B-articles either from three selected B2B-journals or according to certain keywords from other marketing journals, the scope of the investigation is automatically limited. Other keywords or a wider selection of journals might alter the results accordingly and may change the picture gained of B2B-research. However, it is reasonable to assume, that the literature analyzed represents the major research efforts within the discipline since compared to existing literature reviews the insights are to some extent similar. Also the division into four periods of investigation influences the outcome of the study, yet it was made in accordance with similar citation studies (e.g. Pasadeos et al. 1998; White & McCain 1998) and following the consideration of getting a sufficient population.

Moreover, the study is also subject to limitations that are inherent in the bibliometric methods itself. Basically citation and co-citation analyses assume, that authors usually cite their influences, so that citations are an appropriate surrogate for the influence of the cited work (Smith 1981, S. 88). In fact citing motives can differ tremendously and may even include reasons, which do not hold this assumption (Üsdiken & Pasadeos 1995, p. 509). For instance some authors cite friendly researchers not for their content, but in order to increase their citation counts (Garfield 1979b, p. 361). Since it is impossible to distinguish citations according to their motives, such citing behavior may affect the outcome of the study. However, the amount of citations, of which the motives are not related to their actual influence, is small and additionally to some degree controlled by the strict review process of the publishing journal (Ramos-Rodriguez & Ruiz-Navarro 2004, p. 1001). Furthermore, since the applied types of analysis are retrospective in nature, developments in a discipline are only reflected in citation and co-citation structures after a certain time has passed, because a publication needs to be exposed to the scientific community for a while before it has sufficiently been cited to appear in the results (McCain 1986, p. 121). This is also the reason, that works published towards the end of a certain investigation period have had less time to be cited and thus usually have lower citation counts compared to earlier published works (Ramos-Rodriguez & Ruiz-Navarro 2004, p. 1001). But even taking these restrictions into account

should not fundamentally change the picture of B2B-marketing research drawn here. However, one particular drawback of co-citation analysis is that in contrast to its composition, which is solely based on the consensual judgment of the citing authors, the interpretation of the co-citation networks is subjectively done by the authors, yet based on the body of writings of the mapped authors. Therefore it is important to understand the results of this study as an enhancement to prior research about the evolution of B2B-marketing and reflect the findings accordingly.

On the whole citation and co-citation analysis creates a valid representation of the intellectual structure of the field, still further research sharpening the picture could be conducted. For example the scope of investigation can be broadened by compiling the citations to all authors of a publication and not only the first-mentioned one. It can be expected, that especially the CV of certain co-authors will increase, which will affect the composition of the co-citation clusters (Gmür 2003, p. 28). However the revealed topical structure of the discipline will remain mostly unchanged, because the research orientation of co-authors is already subsumed under the first author's name (Culnan 1987, p. 343). Moreover for detecting even small structural changes within the topical orientation of B2B-marketing, the detail level of the analysis could be increased by choosing the single document instead of the author as the unit of analysis (White & Griffith 1981, p. 164). Thereby a more microscopic view of the discipline can be established (Bayer et al. 1999, p. 444) as each node in each networks cluster is then equal to only one publication. For cluster formation solid co-citation relationships between the single works are sufficient, so that especially smaller subfields like different streams of research within one major topic can be investigated. For instance co-citations between IMP-related publications could be investigated, to assess if the research orientation inside the group is as homogeneous as it is perceived from the outside.

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