

Business Ecosystem: More Than a New Name for Supply Chain?

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In the early 1980s, the term “supply chain management” (SCM) rose to prominence, starting its triumphal procession. Almost 10 years later, the first article focusing on the business ecosystem (BE) concept was published. Authors who were actively involved in SCM research participated in subsequent publications. Already at this point, Bechtel and Jayaram stated that the concept of the BE overlaps with that of SCM. Despite the initial doubts about the novelty of the BE concept, the publication rate has steadily increased, without making a clear distinction between the two concepts. Similar to the discussion on the distinction between logistics and SCM, the question arises: Is the BE more than a new name for the supply chain? First, this article analyzes the available literature to identify elements for distinguishing the concepts. Second, the literature-based findings were validated and further completed using expert interviews. As a result, we present a list of 20 elements grouped into five dimensions: (1) actors, (2) the relations between actors, (3) the structure of the network, (4) the product, and (5) the platform. Third, we empirically investigate whether these elements are actually perceived by national and international researchers in the field of BEs and/or SCM. The results suggest that some differences between these concepts, e.g., the mutual dependency among actors, are not necessarily recognized. A differentiation based on the relationship type, the variety of actors within the network, and the product can be considered. Based on the insights gained, implications for business ecosystem management can be derived.

Keywords: Business Ecosystem, Supply Chain, Supply Chain Management, SCM.

1 Introduction

Recently, the business ecosystem (BE) concept – borrowed from ecology – has gained acceptance in economics. Over the last few years, there has been a surge of interest in the concept (Bogers *et al.*, 2019; Schmidt *et al.*, 2018). A Google Scholar search of the term “business ecosystem” results in more than 9,000 publications between 2016 and 2020 (see Figure 1). Similarly, the BCG Henderson Institute states that the term “ecosystem” appears 13 times more frequently in annual reports today than a decade ago (BCG Henderson Institute, 2020). This increase may be due to ongoing digitization, the spread of digital platforms, and advanced information and communication technology. The term “ecosystem” was first introduced in an economic context by Moore (1993) in his article “Predators and Prey: A New Ecology of Competition”. Moore (1996, p. 26) defines a BE as an “[...] economic community supported by a foundation of interacting organizations and individuals [...]. The economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders”.

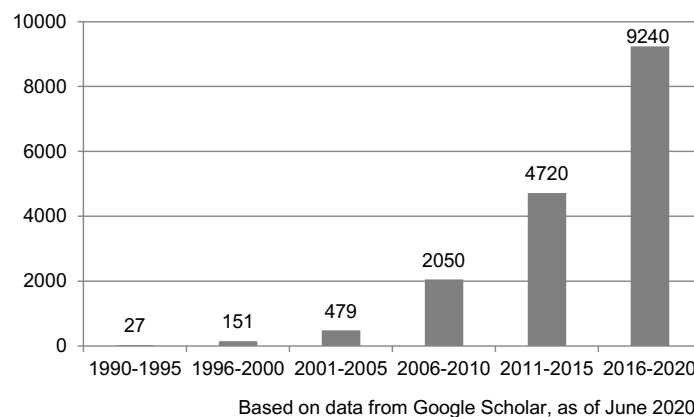


Figure 1. Number of publications between 1990 and 2020

In Moore’s concept, the analogy to biological ecosystems was severely criticized. In this context, Koenig (2012, p. 210) points out, “When we see the ease with which Moore presents certain principles of ecology, it becomes even more difficult to view this analogy as nothing more than a clever manner to attract attention”. In addition to this criticism, one point in particular is striking: the content-related proximity to the concept of the supply chain (SC) or supply chain management (SCM). The overlap and apparent equivalence between the SC and BE concepts become clearer when comparing the definitions of both concepts (see Table 1). Christopher (1992, p. 15) defines a SC as a “[...] network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer”. Modern SCs are not simply linear chains or processes – they are complex networks. The products and information flows move within and between the nodes in multilayered, interconnected, and complex networks that link organizations, industries and economies (Christopher and Peck, 2004). Comparing SCM and BEs, Bechtel and Jayaram (1997, p. 15) already state two decades ago that “SCM is similar to the business ecosystem concept since it looks at the interconnection between key processes both within firms and between firms. SCM crystallizes the business ecosystem idea by providing a process framework that enables firms to engage in co-evolution rather than competition”. This finding is supported by further observations in the existing literature.

Table 1. Definitions of the supply chain and the business ecosystem

	Supply Chain		Business Ecosystem
Swaminathan <i>et al.</i> (1998), p. 607	“A supply chain can be defined as a network of autonomous or semiautonomous business entities collectively responsible for procurement, manufacturing and distribution activities associated with one or more families of related products.”	Iansiti and Levien (2004), p. 35	“[...] business ecosystems are formed by large, loosely connected networks of entities. [...] firms interact with each other in complex ways, and the health and performance of each firm is dependent on the health and performance of the whole.”
Govil/Proth (2002), p. 7	“A supply chain is a global network of organizations that cooperate to improve the flows of material and information between suppliers and customers at the lowest cost and the highest speed. The objective of a supply chain is customer satisfaction.”	Peltoniemi (2005), p. 58	“Business ecosystem consists of a large number of participants that can be business firms and other organisations. [...] interconnect-edness enables various interactions between the members. These interactions can be both competitive and cooperative. [...]”
Ivanov <i>et al.</i> (2017), p. 5	“A supply chain (SC) is a network of organizations and processes wherein a number of various enterprises [...] collaborate (cooperate and coordinate) along the entire value chain to acquire raw materials, to convert these raw materials into specified final products, and to deliver these final products to customers.”	Teece (2018), p. 151	“A business ecosystem is a group of interdependent organizations collectively providing goods and services to their customers.”
Mentzer <i>et al.</i> (2001), p. 4	“[...] a supply chain is defined as a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer.”	Ketchen <i>et al.</i> (2014), p. 166	“[...] a supply ecosystem [is defined] as a set of interdependent and coordinated organizations that share some common adaptive challenges and that collectively shape the creation and nurturing of a sourcing base that contributes to competitive advantage and superior performance.”
Christopher (1992), p. 15	“[...] network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.”	Bogers <i>et al.</i> (2019), p. 4	“[...] an ecosystem [defined] as an interdependent network of self-interested actors jointly creating value.”

For example, by integrating SCM techniques, Wal-Mart has reduced costs and decreased inventories while improving efficiency and customer satisfaction (Chapman *et al.*, 2000; Nguyen, 2017). Wal-Mart is probably the best documented example of successful SCM (Nguyen, 2017). Therefore, it is surprising that Iansiti and Levien (2004, p. 1) conclude that “Wal-Mart [...] is successful because it figured out how to create, manage, and evolve an incredibly powerful business ecosystem”. However, using the terms as synonyms or

combining them into, e.g., “global supply chain ecosystems” (see Millar, 2015) leads to confusion within academia. To address this issue and to enable further targeted research, clarity with regard to the object of research is essential, and thus, a precise distinction is provided in terms of the overlap, redundancy, and boundaries of the two concepts. Against this background, the leading research question is ‘*How are business ecosystems different from supply chains?*’ that is further split into two subquestions, namely

SQ1. Regarding the SC and BE concepts, which distinguishing elements can be identified?

SQ2. Are these differences perceived by national and international researchers?

To date, only a few research papers, e.g., Jacobides *et al.* (2018) and Adner (2017), have highlighted some similarities and differences between the two concepts. The work most similar to this research is from Cooper *et al.* (1997). They discussed the distinction between logistics and SCM. Furthermore, they extended the existing definitions and understanding of SCM and suggested a framework that includes all key components of the SCM literature. Our study transfers the idea of distinguishing the concepts to the context of SCs and BEs. The remainder of the article is structured as follows: The next section describes the approach and the results of the literature analysis and semistructured interviews in practice to identify elements that can be used to differentiate the concepts. Section 3 outlines the design of the empirical study and presents its research results. The article concludes with a summary of the main findings and a description of the limitations and future research opportunities.

2 The supply chain versus the business ecosystem – distinguishing elements

In light of the increased interest in BEs (Bogers *et al.*, 2019; Schmidt *et al.*, 2018), some authors have discussed similarities and differences between the SC and BE concepts. Similar to the article by Larson and Halldorsson (2002), three predominant perspectives can be identified in the literature: (A) SCs are considered one aspect of the BE, (B) the terms SC and BE are used synonymously, and (C) SCs and BEs share an intersection.

Faber *et al.* (2018, p. 2) state that “[...] a business ecosystem extends the classic supply chain, consisting of suppliers and customer, by also including other entities within the business environment of the enterprise”. This perspective (A) is also supported by, for example, Arenkov *et al.* (2019) and Tsujimoto *et al.* (2018). However, referring to the introduction, Bechtel and Jayaram (1997, p. 15) note that “SCM is similar to the business ecosystem concept since it looks at the interconnection between key processes both within firms and between firms”. This view on the equivalence of the concepts (B) is also shared by, e.g., Ketchen *et al.* (2014). In addition, Gossain and Kandiah (1998, p. 31) point out that the “[...] basis of the new business ecosystem is similar to an integrated value chain”. In contrast, the SC concept does not fully encompass the BE concept (perspective C). For example, some participants are involved in both concepts. Nevertheless, as Kapoor (2018, p. 3) remarks, there are significant differences “[...] in terms of both their focus and their line of inquiry”. For the sake of comprehensiveness, we suggest adding two further perspectives. First, the BE is perceived as part of the SC (D). This perspective represents the opposite of A. Second, SCs and BEs are two different streams without overlap (E). The five perspectives, which cover all possibilities of how the two concepts could be interlinked, are shown in Figure 2. Below, this article focuses on whether and which elements can be used to distinguish the concepts and whether these elements are also perceived by national and international researchers to be able to make a statement in terms of which of these perspectives best reflects the interrelation between the concepts.

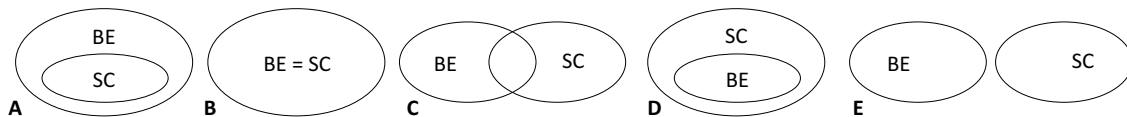


Figure 2. Perspectives on the concepts of the SC and the BE

2.1 Literature analysis

To identify publications that highlight similarities and differences between SCs and BEs, we performed a literature search (ending in December 2019). Therefore, the databases EBSCO, Google Scholar, Springer Link, and Web of Science were considered that were searched among others for the key phrases “supply chain”, “management”, and “business ecosystem” appearing in titles, abstracts, and keywords. The search was complemented by a forward and backward search based on Webster and Watson (2002). Notably, our search included English journal articles, conference contributions, and monographs, while other publications, such as press reports, were excluded. After eliminating duplicates, all articles containing the terms searched were individually reviewed by (1) title and abstract and (2) full text. A total of 23 articles were considered relevant for further analysis. The list with the references (L1–L23) can be found in Appendix A. The publications were analyzed in MAXQDA Plus 2020 using a content analysis following Krippendorff (2019). Each article represents a unit of analysis. The material was first screened by coder A, who coded all sections in which authors mentioned elements to distinguish the two concepts. Afterwards the coded sections were extracted and structured according to their content consistency. To confirm that the coded sections identified were not limited to one researcher, a second coder (coder B) worked through the same articles. The analysis results were documented independently and were then merged together and compared by one researcher. Inter-coder reliability (representing the number of matching codings divided by the total number of codings) of 67.4 % was achieved.

A preliminary list of 40 elements that can be used to distinguish the two concepts was developed. In particular, the literature analysis helped to identify elements in the “actors”, “relations between actors”, “structure”, “product”, and “platform” dimensions. For example, Mäntymäki and Salmela (2018, p. 109) argue that BE actors operate across traditional company and industry boundaries, stating that an “[...] ecosystem can be seen as a large number of loosely interconnected participants from various industries [...]” (E1). Given this fact, Lehmacher (2017, p. 69) notes in his book that “[...] boundaries between industries and even systems have started to blur” (E12). Moreover, Arenkov *et al.* (2019, p. 457) describe the relationships of SC actors as “[...] closely linked by contractual relations” (E10). Another element concerns the changed consumer offering in the BE. Faber *et al.* (2018, p. 2261) conclude that “[...] end customers choose from a set of producers or complementors who are bound together through some interdependencies [...]” (E17). Several authors also refer to the important role of platforms. According to Arenkov *et al.* (2019, p. 457) “[...] ecosystems [are] coordinated by a central platform that is continuously accumulating and processing data on the interactions of people, processes and devices in the ecosystem” (E20).

2.2 Semistructured interviews

Thus far, the investigation has concentrated exclusively on the existing theoretical views. However, as the analysis of annual reports by the BCG Henderson Institute (2020) shows, BEs play an increasingly important role in companies, triggered by progressive digitization and the further development of information and communication technology. Moreover, SCs and their management have been firmly established in many companies for decades (Lambert and Enz, 2017; Nguyen, 2017). For this reason, it is all the more important to incorporate the findings and experiences of practice at this point. Therefore, we extend the previous analysis by conducting semistructured interviews with the aim of understanding the

prevailing views on the differences between the two concepts in practice and, thus, identifying further elements. Interviews enable respondents to rethink topics and core content and to reflect on their experiences and perceptions from practice. Due to their semistructured character, the research objective remains the focus, but at the same time, room is left for new perspectives. The interviews consisted of two parts. The first part aimed to set the scene. It checked whether the respondents were familiar with the concepts and how many years of experience they already had in their field. The second part focused on elements for distinguishing the two concepts and, more precisely, the following question: "What specific differences exist between the supply chain and the business ecosystem?". Potential participants were identified via professional social networks (XING and LinkedIn). Work experience of at least two years in the SCM and/or BE field, which served as proof of professional competence, was used as the selection criterion. The experts were contacted individually. Due to the physical distance between participants, the interviews were conducted by telephone. Rogers (1976) was able to verify that telephone interviews are just as effective as face-to-face interviews. When analyzing the collected material, we could not find any limitations regarding the telephone-based interview method. In total, ten interviews were conducted in January 2020. The interviewees, mostly from the management level, were representatives of companies from a wide range of industries (see Table 2). Each interview lasted approximately 37 to 57 minutes and was recorded and transcribed. Analogous to the articles from the literature search, the interviews were examined using a content analysis. The procedure for analyzing the interview material was similar to that used in the literature analysis. The same coders independently worked through the interview material. In this case, intercoder reliability of 73.0 % was achieved. Overall, the preliminary list contained 81 elements that the practitioners used to distinguish between SCs and BEs. The interviewees confirmed some results from the literature, e.g., the mutual dependency among participants (E4) and the focus on the end customer in the BE (E18). Additionally, some participants emphasized further elements in the "relations between actors", "structure", "product", and "platform" dimensions that have not been mentioned in the literature to date. For example, interviewee 3 pointed out that "[...] in traditional supply chain management, there are long-term contracts [...]" that serve as the basis for cooperation between actors (E11). He also indicated that "[...] in the case of ecosystems, it is usually a matter of clarifying that these are the terms and conditions or the rules that the actor must comply with or qualify for to participate" (E14). Without the specification of frameworks and guidelines, an ecosystem will not be successful. In addition, some practitioners argued that the final product consists of a variety of offerings with complementary products in BEs (E16). Interviewee 6 underlined this point, stating that customers "[...] not only choose the composition of [the] product but also [the] product portfolio itself". Furthermore, several practitioners (I1, I2, I3, I5) defined the platform as the core of the BE (E19). Interviewee 5 emphasized that "[...] they contain certain mechanisms that make it particularly efficient to orchestrate ecosystems [...]". After completion of the literature and interview analysis, the two lists with elements that can be used to differentiate between the two concepts were compared. Elements that were related to each other or that show content consistency were merged; thus, a total of 105 elements could be identified.

3 Empirical study on the perception of academia

As Cachon *et al.* (2020, p. 214) noted, "[...] a high degree of focus on a specific problem or context may provide a spectacular solution for a particular application, but unless the solution generalizes, it is of limited value [...]". To be able to make valid statements about the elements that can be used to distinguish the SC and BE concepts, it is necessary to examine the elements identified in an empirical study. The aim is to test whether national and international SCM and/or BE researchers perceive these elements to differentiate the concepts. To keep the dropout rate at an acceptable level, we relied on the elements that were mentioned by at least three different authors and/or interviewees and can thus be

Table 2. Characteristics of the interview partners

Ref.	Area of activity	Experience in the area of activity	Industry	Company's turnover
[I1]	BE	5 years	Conglomerate	> 50 billion €
[I2]	SCM and BE	25 years	Consulting & market research	1–10 billion €
[I3]	SCM and BE	15 years	Medical technology	10–50 billion €
[I4]	BE	10 years	Conglomerate	> 50 billion €
[I5]	BE	20 years	IT & tax consulting	1–10 billion €
[I6]	SCM	26 years	Conglomerate	> 50 billion €
[I7]	SCM and BE	15 years	Electronics industry	< 1 billion €
[I8]	SCM	2 years	Malt and brewing industry	< 1 billion €
[I9]	SCM	9 years	Metal industry	1–10 billion €
[I10]	SCM	14 years	Chemical industry	> 50 billion €

regarded as stable opinions. For instance, the element “participants on equal footing in business ecosystems” was excluded. Müller-Stewens and Stonig (2019, p. 382) pointed out that in BEs, “[...] participants meet on eye level”, which was also mentioned by interviewee 10. However, no further references were found in the analyzed literature or the interviews. The exclusion of such elements resulted in 20 items, which are listed in Table 3. In addition, Appendix B lists a concrete text passage for each element.

3.1 Study design

Regarding RQ2, we pursued a quantitative empirical research approach. An online questionnaire containing two parts was developed. A maximum of nine questions on the SC and BE concepts formed the first part. Q3 and Q4 collected data on how the respondents perceive the two concepts. The answer options given for Q5–Q9 were based on the available literature. For instance, Q5 focused on the perspectives on the two concepts presented in section 2. Furthermore, Moore (1996), Iansiti and Levien (2002), Aarikka-Stenroos *et al.* (2016), Peltoniemi and Vuori (2008), Faber *et al.* (2018), Rong *et al.* (2015), and Viswanadham and Samvedi (2013) served as the basis for the identification of actors involved in the SC and/or BE (Q6). In Q8, the participants assigned the statements formulated in Table 3 to the concepts (“supply chain & business ecosystem”, “supply chain only”, “business ecosystem only”, and “neither/nor”). The second part focused on questions concerning demographic data (e.g., age, gender, current academic position). The questionnaire was made available in both English and German to reach international participants. A pretest resulted in only minor changes in wording and design. To identify potential participants, the homepages of all German (85 universities), Austrian (22) and Swiss universities (13) were searched for researchers (e.g., professors, postdocs, PhD candidates) from institutes and departments indicating the SC (SCM) and/or the BE as their research focus. In addition, the homepages of the top 100 European universities (QS World University Ranking, 2020) and the top 100 world universities (data based on ARWU, 2020; QS World University Ranking, 2020; Times Higher Education, 2020; as of May 2020) were searched for potential international researchers with the same research focus. The link to the survey was sent to researchers from 337 universities. The field phase took place from mid-May to the end of June. Overall, 291 researchers clicked on the provided link, of whom 140 completed the questionnaire in full. A completion rate of 48.1 % was achieved. The data sets were examined for potential late-response bias. No significant differences at the $\alpha=0.05$ level were found.

Table 3. Final list of elements

Dimension	SC/BE	No	Elements	References
Actors	BE	E1	The network includes actors from various sectors and industries.	[L1,L10,L12,L14,L15,L17,L18,I1,I2,I3,I5,I6,I7]
		E2	The network includes a variety of actors with a direct influence on value creation.	[L2,L7,L9,L13,L18,L22,I1,I3,I5,I6,I7,I8,I10]
		E3	The network includes a variety of actors with an indirect influence on value creation.	[L2,L7,L9,L13,L18,L22,I1,I3,I5,I6,I7,I8,I10]
Relations between actors	BE	E4	The actors have considerable mutual dependency.	[L5,L8,L10,L11,L15,L17,I2,I3,I6,I10]
		E5	The network mainly consists of loose connections between the actors.	[L15,L19,L23,I5,I7]
		E6	The network enables cooperative relationships.	[L4,L15,L17,I2,I3,I5,I6,I7]
	SC	E7	The network enables competitive relationships.	[L4,L15,L17,I2,I3,I5,I6,I7]
		E8	The network is unilaterally, hierarchically coordinated and controlled.	[L3,L10,L17,L20,I6,I7,I8]
		E9	The network mainly consists of close connections between the actors.	[L8,L19,I3,I7]
		E10	Cooperation between the actors is regulated by contractual agreements.	[L2,L10,L16,L23]
Structure	BE	E11	The actors are usually bound to each other by long-term contracts.	[I3,I6,I7,I8,I9]
		E12	The boundaries within which the network operates are blurring.	[L6,L8,L12,L21,I7]
		E13	The structures of the network are flexible.	[I4,I7,I10]
		E14	Guidelines and frameworks with which the actors must comply to participate in the network will be provided.	[I1,I2,I3,I4,I5,I6,I7,I10]
Product	BE	E15	The value of the final product will be created by a combination of products and/or services.	[L6,L10,L11,L16,L23,I3,I6,I7,I8]
		E16	The final product consists of a product portfolio with a variety of complementary products from different actors.	[I1,I2,I3,I6,I8,I10]
		E17	The end customer can choose from a number of components that can be combined to create his or her individual final product.	[L10,L16,I6]
		E18	The end customer and his or her needs are the focus of the network.	[L11,I1,I2,I4,I5,I6,I10]
Platform	BE	E19	The platform business model is an integral part of the network.	[I1,I2,I3,I5]
		E20	The central control element of the network is a platform.	[L2,L11,I2,I3,I5,I6]

The majority of the researchers worked in Europe (92.5 %), mainly in Germany (66.2 %), the Netherlands (6.0 %), and Austria and Denmark (5.3 % each). Overall, the participants were predominantly male (77.9 %); the average age of the respondents was 36 years. Most participants worked as PhD students (59.1 %), followed by professors (27.0 %), postdocs (11.7 %), and other academic positions (2.2 %). Their average experience in academic research is approximately 8.6 years. In addition, almost two-thirds of the researchers (60.9 %) have practical experience from industry and trade (Ø 4.7 years). The participants indicated SCM (24.1 %), operations management (13.9 %), and information systems (13.1 %) as their personal research focus.

3.2 Results and discussion

Almost half of the respondents (45.7 %) indicated that they were familiar with both concepts (SC: Ø 9.7 years, BE: Ø 5.1 years) (Q1; Q2). Approximately one-third (32.9 %) were exclusively familiar with the SC concept (Ø 7.8 years), whereas 3.6 % were working with only the BE concept (Ø 2.4 years). Less than one-fifth of the respondents (17.9 %) were unfamiliar with either concept and did not further participate in the study.

Approximately half of the researchers (46.0 %) agreed that the two concepts are sufficiently differentiated in the literature (Q3). In contrast, 22.1 % did not find them to be clearly delimited, and 31.9 % chose “neither/nor” category. The lack of unity was also reflected in the literature. Although articles that briefly mention differences are already available (e.g., Jacobides *et al.*, 2018; Kapoor, 2018; Rong *et al.*, 2015; Teece, 2018), to date, a comprehensive delimitation is lacking. Moreover, the majority of the researchers (85.0 %) agrees that there are sufficient management concepts for SCs. The situation is different for BEs: 35.1 % would appreciate further management concepts, whereas 22.5 % considered the existing number to be adequate.

Moreover, the respondents confirmed that the SC concept has already been important in the past for academia (92.7 %) and for practice (90.8 %) (Q4). The number of those who perceived the concept as being very important for the future rises to 60.6 % in regard to academia and 79.8 % in regard to practice (see Figure 3 and Figure 4). By contrast, the importance of the BE was considered to be much lower for academia (11.0 %) and for practice (17.4 %) five years ago. However, there will be a significant increase in its importance over the coming years (academia: 55.0 %; practice: 48.6 %).

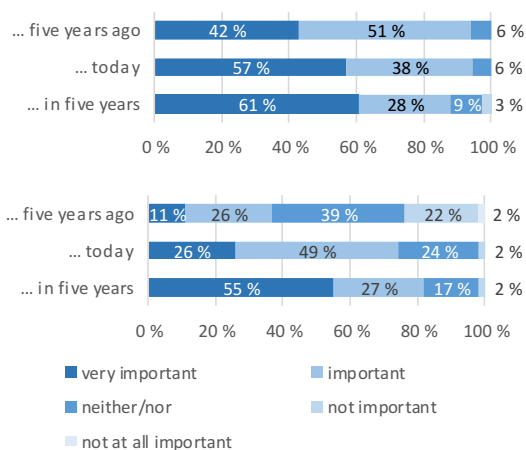


Figure 3. Importance of the SC (top) and the BE (bottom) in academia

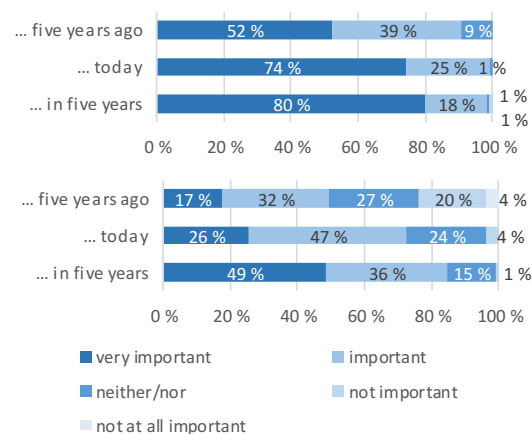


Figure 4. Importance of the SC (top) and the BE (bottom) in practice

A narrow majority of the researchers (perspective A: 54.4 %) regarded the SC as part of the BE (Q5). In contrast, just under 40 % (C) stated that the SC and BE have an intersection. Thus, two of the prevailing perspectives in the literature united almost 95 % of the respondents. The other perspectives were hardly selected (B: 1.8 %; D: 4.4 %) or were not selected at all (E: 0 %). The answers are therefore a strong indicator that there are differences between the two concepts.

Regarding the type of goods, hardly any differences between the concepts could be identified (Q7). At least 70 % of the respondents agreed that tangible goods, services, and hybrid and digital products can be managed by both a SC and a BE (see Figure C2 in Appendix C). In the following, the researchers identified long-term contracts (E11; 50.5 %), which are mainly used in SCs, and the relationship type among the actors as differences between the two concepts (Q8; see Figure 5). In SCs, predominantly close relationships exist between the actors (E9; 53.2 %), while in BEs, loose relationships prevail (E5; 49.5 %).

Actors from different sectors and industries (E1; 72.8 %) and with a direct influence on value creation (E2; 70.2 %) are part of SC and BE networks. In addition, the researchers mostly agreed that direct suppliers (87.6 %), the suppliers of my suppliers (64.0 %), direct customers (86.0 %), the customers of my customers (51.3 %), and technology companies (49.6 %) are involved as actors in SCs and BEs (Q6; see Figure C1 in Appendix C).

According to half of the respondents, the group of actors in a BE differs from their SC counterparts in terms of their competitors (54.0 %), standards bodies (49.1 %), regulatory authorities (50.9 %), government institutions (47.4 %), financial institutions (54.4 %), investors (52.6 %), and trade associations (52.2 %). In addition, most of the respondents extended the range of actors to include universities (48.2 %) and labor unions (47.4 %). However, almost one in three considered that they are neither part of the SC nor part of the BE. In addition, two participants extended the list of actors within the BE to include environmental and social movements (1) and noncustomers (1).

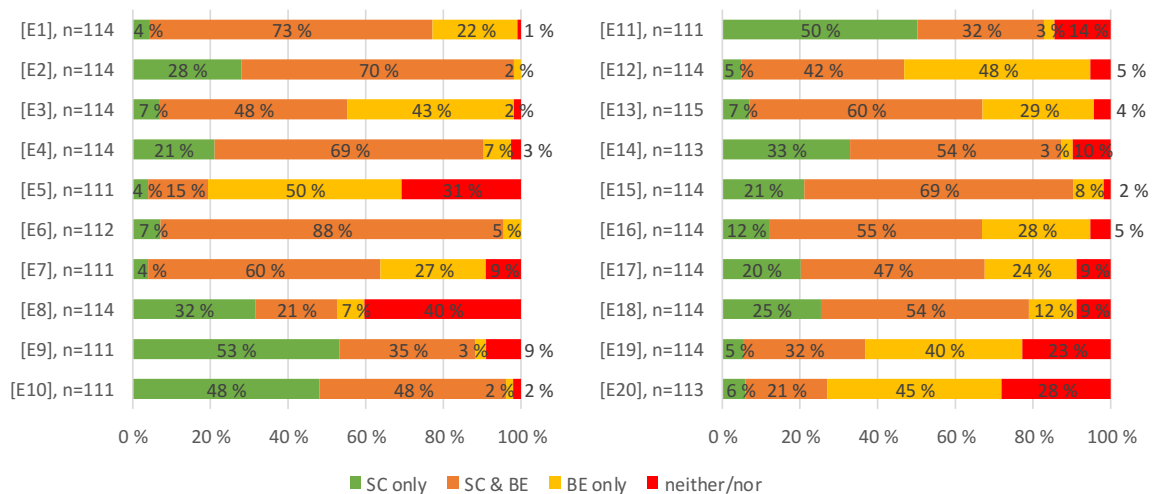


Figure 5. Elements to distinguish SCs and BEs

Furthermore, the majority of researchers perceives the interdependence of actors (E4; 69.3 %) and the flexible structures of the network (E13; 60.0 %) as being characteristics that are common to both concepts. In SCs and BEs, the focus is on the end customer and his or her needs (E18; 53.5 %). According to most participants, the value of the end product can be created from a combination of products and services (E15; 69.3 %) in SCs and BEs. The variety of complementary products (E16; 54.4 %) as well as the individually customized end product (E17; 47.4 %) does not represent a unique selling point of the BE according to half of the researchers. For approximately 40 % of the respondents, platforms play a role in BEs (E19; E20), while approximately 25 % concurred that they are neither an integral part nor a central control element in either concept. Finally, the participants mostly confirmed that the relationship (84.2 %), data and information (84.2 %), innovation (70.2 %), customer (69.3 %), process (72.8 %), quality (67.9 %), risk (77.2 %), and sales management (70.2 %) areas belong to both SCM and business ecosystem management (BEM), with relationship and data and information management accounting for the largest percentage (Q9; see Figure C3 in Appendix C). Almost half of the researchers also assigned production management (58.8 %) and human resource management (51.8 %) to both concepts as part of their management. However, approximately one in four respondents (22.8 %) considered that human resource management is neither part of SCM nor part of BEM. The greatest disagreement with regard to the assignment to the concepts was found for procurement/supplier and logistics management. Half of the respondents assigned the two areas to SCM and BEM; the other half disagreed that they are part of BEM. In addition, financial management (two participants) and environmental management (one participant) were added to the list of management areas. Both were considered to be part of BEM.

We also tested whether there were differences in the response behavior of participants who were familiar with both concepts (P2C) and participants who were familiar with only one concept (P1C). No significant differences at the $\alpha=0.05$ level regarding the type of goods were found (see Table C2 in Appendix C). However, we identified differences between the groups for five actors involved in SCs or BEs (see Table C1 in Appendix C). P2C more often stated that regulatory authorities, owners, investors, trade associations, and labor unions do not participate in either concept, while P1C more frequently perceived them as actors in both concepts. Moreover, only for distinction element E9 could a difference in response behavior be found (see Table C3 in Appendix C). P1C more often assumed that there are close connections between the actors in both SCs and BEs (44.0 %), while only every fourth P2C concurred that close connections exist in both concepts. Finally, significant differences in the areas of data and information management, process management, and quality management were observed (see Table C4 in Appendix C). P1C more often confirmed that the management of the two concepts includes data and information management, process management, and quality management. By contrast, P2C attributed them exclusively to SCM.

4 Conclusion

The literature analysis and semistructured interviews reveal elements that can be used to distinguish between BEs and SCs. While SCs refer to a product or product group, BEs comprise several complementary end products. Thus, a SC represents the value-added process from the raw material supplier to the end consumer, whereas a BE focuses on the customer benefit that is created by combining complementary products. Due to the interaction of different providers, the total benefit is based on the "1+1=3" principle. The whole is more than the sum of its parts: The benefit of combining products A and B is higher than that if the services are received individually.

Both SCs and BEs are networks of autonomous or semiautonomous organizations. In SCs, however, the roles of actors and the relationships between them are clearly defined by their position in the value creation process. Thus, a SC can be decomposed into a network of bilateral buyer-supplier relationships, and cooperation between the actors is regulated by contractual agreements. In BEs, the relationships between actors from different industries are looser. In SCs, the actors are defined by the value-added process, whereas the members of a BE are formed by the various complementary products and services. In summary, the differences between SCs and BEs result from the products and services offered, the actors involved, and the relationships within the network.

In contrast, our empirical study indicates that these differences are not necessarily perceived by researchers. Conceptual ambiguities are already harmful at the beginning of any research. If the object of research is not clearly defined, one does not even know exactly where to look. Only if it is possible to clearly differentiate BEs from other related concepts, such as SCs, can further research questions be analyzed. For example, what are the processes, drivers and challenges that influence the emergence and management of BEs? Both the goal-oriented design (BE configuration) and the management (BE planning) of BEs represent important future research areas. However, if a BE is intended to become the subject of planning, coordination and design activities, that which is to be designed, coordinated and planned must be clarified.

One limitation of this article is that the empirical study focused exclusively on the 20 items, even though other elements were suggested in the literature and the interviews. Therefore, it should be noted that this study does not claim to be exhaustive. Instead, it should be a starting point to achieve more clarity with regard to the object of research and to enable further targeted research. Since the data were predominantly collected from the European area, the study mostly reflects a European-centric view, which limits generalizability. For this reason, the study should be replicated in other regions, such as North America or Asia. Additionally, the primary focus of this article was on BEs and not on other ecosystem approaches, such as innovation ecosystems or platform ecosystems, which may allow for

further elements of distinction. Despite these limitations, this study represents a first step towards overcoming the ambiguity concerning the object of research that hinders the applicability of the BE concept.

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Appendix A. Complete List of the 23 Studies

No	Reference of articles
[L1]	Anggraeni, E., den Hartigh, E. and Zegveld, M. (2007), “Business Ecosystem as a Perspective for Studying the Relations Between Firms and Their Business Networks”, in ECCON 2007.
[L2]	Arenkov, I., Tsenzharik, M. and Vetrova, M. (2019), “Digital Technologies in Supply Chain Management”, in International Conference on Digital Technologies in Logistics and Infrastructure (ICDTLI) 2019, pp. 453–458.
[L3]	Bosch, J. (2016), “Speed, Data, and Ecosystems. The Future of Software Engineering”, IEEE Software, Vol. 33, No. 1, pp. 82–88.
[L4]	Deloitte, “Business Ecosystems Come of Age”, 2015, available from: https://www2.deloitte.com/content/dam/insights/us/articles/platform-strategy-new-level-business-trends/DUP_1048-Business-ecosystems-come-of-age_MASTER_FINAL.pdf , accessed 15 June 2020.
[L5]	Den Hartigh, E., Tol, M. and Visscher, W. (2006), “The Health Measurement of a Business Ecosystem”, in ECCON 2006.
[L6]	El Sawy, O.A. and Pereira, F. (2013), <i>Business Modelling in the Dynamic Digital Space. An Ecosystem Approach</i> , Springer, Berlin, Heidelberg.
[L7]	Faber, A., Hernandez-Mendez, A., Rehm, S.-V. and Matthes, F. (2018), “Visualizing Business Ecosystems: Applying a Collaborative Modelling Process in Two Case Studies”, in Australasian Conference on Information Systems 2018.

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- [L16] Müller-Stewens, G. and Stonig, J. (2019), "Business Ecosystems and Platforms: Towards a Shared Understanding", *Die Unternehmung*, Vol. 73, No. 4, pp. 381–386.
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Appendix B. List of the Elements with Example

Dimension	SC/BE	No	Element	Example with reference	References	
Actors	BE	E1	The network includes actors from various sectors and industries.	“An ecosystem can be seen as a large number of loosely interconnected participants from various industries [...]” (L15, pp. 109)	[L1,L10,L12,L14,L15,L17,L18,L19,L20,L21,L22,L23,L24,L25,L26,L27,L28,L29,L30,L31,L32,L33,L34,L35,L36,L37,L38,L39,L40,L41,L42,L43,L44,L45,L46,L47,L48,L49,L50,L51,L52,L53,L54,L55,L56,L57,L58,L59,L60,L61,L62,L63,L64,L65,L66,L67,L68,L69,L70,L71,L72,L73,L74,L75,L76,L77,L78,L79,L80,L81,L82,L83,L84,L85,L86,L87,L88,L89,L90,L91,L92,L93,L94,L95,L96,L97,L98,L99,L100,L101,L102,L103,L104,L105,L106,L107,L108,L109,L110,L111,L112,L113,L114,L115,L116,L117,L118,L119,L120,L121,L122,L123,L124,L125,L126,L127,L128,L129,L130,L131,L132,L133,L134,L135,L136,L137,L138,L139,L140,L141,L142,L143,L144,L145,L146,L147,L148,L149,L150,L151,L152,L153,L154,L155,L156,L157,L158,L159,L160,L161,L162,L163,L164,L165,L166,L167,L168,L169,L170,L171,L172,L173,L174,L175,L176,L177,L178,L179,L180,L181,L182,L183,L184,L185,L186,L187,L188,L189,L190,L191,L192,L193,L194,L195,L196,L197,L198,L199,L200,L201,L202,L203,L204,L205,L206,L207,L208,L209,L210,L211,L212,L213,L214,L215,L216,L217,L218,L219,L220,L221,L222,L223,L224,L225,L226,L227,L228,L229,L230,L231,L232,L233,L234,L235,L236,L237,L238,L239,L240,L241,L242,L243,L244,L245,L246,L247,L248,L249,L250,L251,L252,L253,L254,L255,L256,L257,L258,L259,L260,L261,L262,L263,L264,L265,L266,L267,L268,L269,L270,L271,L272,L273,L274,L275,L276,L277,L278,L279,L280,L281,L282,L283,L284,L285,L286,L287,L288,L289,L290,L291,L292,L293,L294,L295,L296,L297,L298,L299,L300,L301,L302,L303,L304,L305,L306,L307,L308,L309,L310,L311,L312,L313,L314,L315,L316,L317,L318,L319,L320,L321,L322,L323,L324,L325,L326,L327,L328,L329,L330,L331,L332,L333,L334,L335,L336,L337,L338,L339,L340,L341,L342,L343,L344,L345,L346,L347,L348,L349,L350,L351,L352,L353,L354,L355,L356,L357,L358,L359,L360,L361,L362,L363,L364,L365,L366,L367,L368,L369,L370,L371,L372,L373,L374,L375,L376,L377,L378,L379,L380,L381,L382,L383,L384,L385,L386,L387,L388,L389,L390,L391,L392,L393,L394,L395,L396,L397,L398,L399,L400,L401,L402,L403,L404,L405,L406,L407,L408,L409,L410,L411,L412,L413,L414,L415,L416,L417,L418,L419,L420,L421,L422,L423,L424,L425,L426,L427,L428,L429,L430,L431,L432,L433,L434,L435,L436,L437,L438,L439,L440,L441,L442,L443,L444,L445,L446,L447,L448,L449,L450,L451,L452,L453,L454,L455,L456,L457,L458,L459,L460,L461,L462,L463,L464,L465,L466,L467,L468,L469,L470,L471,L472,L473,L474,L475,L476,L477,L478,L479,L480,L481,L482,L483,L484,L485,L486,L487,L488,L489,L490,L491,L492,L493,L494,L495,L496,L497,L498,L499,L500,L501,L502,L503,L504,L505,L506,L507,L508,L509,L510,L511,L512,L513,L514,L515,L516,L517,L518,L519,L520,L521,L522,L523,L524,L525,L526,L527,L528,L529,L530,L531,L532,L533,L534,L535,L536,L537,L538,L539,L540,L541,L542,L543,L544,L545,L546,L547,L548,L549,L550,L551,L552,L553,L554,L555,L556,L557,L558,L559,L560,L561,L562,L563,L564,L565,L566,L567,L568,L569,L570,L571,L572,L573,L574,L575,L576,L577,L578,L579,L580,L581,L582,L583,L584,L585,L586,L587,L588,L589,L590,L591,L592,L593,L594,L595,L596,L597,L598,L599,L600,L601,L602,L603,L604,L605,L606,L607,L608,L609,L610,L611,L612,L613,L614,L615,L616,L617,L618,L619,L620,L621,L622,L623,L624,L625,L626,L627,L628,L629,L630,L631,L632,L633,L634,L635,L636,L637,L638,L639,L640,L641,L642,L643,L644,L645,L646,L647,L648,L649,L650,L651,L652,L653,L654,L655,L656,L657,L658,L659,L660,L661,L662,L663,L664,L665,L666,L667,L668,L669,L670,L671,L672,L673,L674,L675,L676,L677,L678,L679,L680,L681,L682,L683,L684,L685,L686,L687,L688,L689,L690,L691,L692,L693,L694,L695,L696,L697,L698,L699,L700,L701,L702,L703,L704,L705,L706,L707,L708,L709,L710,L711,L712,L713,L714,L715,L716,L717,L718,L719,L720,L721,L722,L723,L724,L725,L726,L727,L728,L729,L730,L731,L732,L733,L734,L735,L736,L737,L738,L739,L740,L741,L742,L743,L744,L745,L746,L747,L748,L749,L750,L751,L752,L753,L754,L755,L756,L757,L758,L759,L760,L761,L762,L763,L764,L765,L766,L767,L768,L769,L770,L771,L772,L773,L774,L775,L776,L777,L778,L779,L780,L781,L782,L783,L784,L785,L786,L787,L788,L789,L790,L791,L792,L793,L794,L795,L796,L797,L798,L799,L800,L801,L802,L803,L804,L805,L806,L807,L808,L809,L810,L811,L812,L813,L814,L815,L816,L817,L818,L819,L820,L821,L822,L823,L824,L825,L826,L827,L828,L829,L830,L831,L832,L833,L834,L835,L836,L837,L838,L839,L840,L841,L842,L843,L844,L845,L846,L847,L848,L849,L850,L851,L852,L853,L854,L855,L856,L857,L858,L859,L860,L861,L862,L863,L864,L865,L866,L867,L868,L869,L870,L871,L872,L873,L874,L875,L876,L877,L878,L879,L880,L881,L882,L883,L884,L885,L886,L887,L888,L889,L890,L891,L892,L893,L894,L895,L896,L897,L898,L899,L900,L901,L902,L903,L904,L905,L906,L907,L908,L909,L910,L911,L912,L913,L914,L915,L916,L917,L918,L919,L920,L921,L922,L923,L924,L925,L926,L927,L928,L929,L930,L931,L932,L933,L934,L935,L936,L937,L938,L939,L940,L941,L942,L943,L944,L945,L946,L947,L948,L949,L950,L951,L952,L953,L954,L955,L956,L957,L958,L959,L960,L961,L962,L963,L964,L965,L966,L967,L968,L969,L970,L971,L972,L973,L974,L975,L976,L977,L978,L979,L980,L981,L982,L983,L984,L985,L986,L987,L988,L989,L990,L991,L992,L993,L994,L995,L996,L997,L998,L999,L1000]	
		E2	The network includes a variety of actors with direct influence on value creation.	“[...] ecosystem comprises of networks of companies directly and indirectly part of the supply chain [...]” (L22, pp. 6485)	[L2,L7,L9,L13,L18,L22,L13,L15,L16,L17,L18,L19]	
		E3	The network includes a variety of actors with indirect influence on value creation.	“[...] ecosystem comprises of networks of companies directly and indirectly part of the supply chain [...]” (L22, pp. 6485)	[L2,L7,L9,L13,L18,L22,L13,L15,L16,L17,L18,L19]	
	Relations between actors	BE	E4	The actors have a considerable mutual dependency	“The essential characteristic that distinguishes the business ecosystem concept from sectors or supply networks is the explicit modeling of the mutual dependence of the actors [...]” (L5, pp. 2)	[L5,L8,L10,L11,L15,L17,L23,L6,L10]
			E5	The network consists mainly of loose connections between the actors.	“An ecosystem can be seen as a large number of loosely interconnected participants from various industries [...]” (L15, pp. 109)	[L15,L19,L23,L5,L7]
			E6	The network enables cooperative relationships.	“Business ecosystem induces both competition and cooperation.” (L17, pp. 61)	[L4,L15,L17,L23,L5,L6,L7]
			E7	The network enables competitive relationships.	“[...] the concept of ecosystem appears to provide a concept that enables the analysis of both collaborative and competitive relationships.” (L15, pp. 111)	[L4,L15,L17,L23,L5,L6,L7]
		SC	E8	The network is unilaterally hierarchically coordinated and controlled.	“Finally, our definition suggests that ecosystems are not unilaterally hierarchically controlled.” (L10, pp. 2266)	[L3,L10,L17,L20,L6,L7,L8]
			E9	The network consists mainly of close connections between the actors.	“[...] adequately capture the close symbiotic relationships between a company, its customers, its suppliers, and its partners .” (L8, pp. 31)	[L8,L19,L3,L7]
			E10	The cooperation between the actors is regulated by contractual agreements.	“Until recently, supply chains have been largely systems where participants are closely linked by contractual relations.” (L2, pp. 457)	[L2,L10,L16,L23]
			E11	The actors are usually bound to each other by long-term contracts.	“While in traditional supply chain management there are long-term contracts [...]” (I3)	[I3,L6,L7,L8,L9]

Dimension	SC/BE	No	Element	Example with reference	References
Structure	BE	E12	The boundaries, in which the network operates, are blurring.	"As a result, boundaries between industries and even systems have started to blur."(L12, pp. 69)	[L6,L8,L12,L21,I7]
		E13	The structures of the network are flexible.	"Business Ecosystem gives much more freedom, flexibility and therefore also dynamics."(I7)	[I4,I7,I10]
		E14	Guidelines and frameworks will be provided, which the actors must comply with to participate in the network.	"[...] in the case of ecosystems, it is usually a matter of clarifying that these are the terms and conditions or the rules that the actor must comply with or qualify for to participate."(I3)	[I1,I2,I3,I4,I5,I6,I7,I10]
		E15	The value of the final product will be created by a combination of products and/or services.	"[...] the value is created by a combination of products and services that are delivered by an extensive group of partners."(L23, pp. 30)	[L6,L10,L11,L16,L23,I3,I6,I7,I8]
Product	BE	E16	The final product consists of a product portfolio with a variety of complementary products from different actors.	"And I as a customer [...] not only choose the composition of my product, but also my product portfolio itself."(I6)	[I1,I2,I3,I6,I8,I10]
		E17	The end customer can choose from a number of components that can be combined to create his individual final product.	"[...] end customers choose from a set of producers or complementors who are bound together through some interdependencies [...]."(L10, pp. 2261)	[L10,L16,I6]
Platform	BE	E18	The end customer and his needs are the focus of the network.	"[...] at the center stands the customer and his needs and the question of how we can address these needs holistically."(I5)	[L11,I1,I2,I4,I5,I6,I10]
		E19	The platform business model is an integral part of the network.	"[...] then platforms play a very special role today because they contain certain mechanisms that make it particularly efficient to orchestrate ecosystems [...]."(I5)	[I1,I2,I3,I5]
		E20	The central control element of the network is a platform.	"[...] transformed into ecosystems coordinated by a central platform [...]."(L2, p. 457)	[L2,L11,I2,I3,I5,I6]

Appendix C. Results of the Empirical Study

Q6 – Actors involved in the supply chain (SC) and/or business ecosystem (BE)

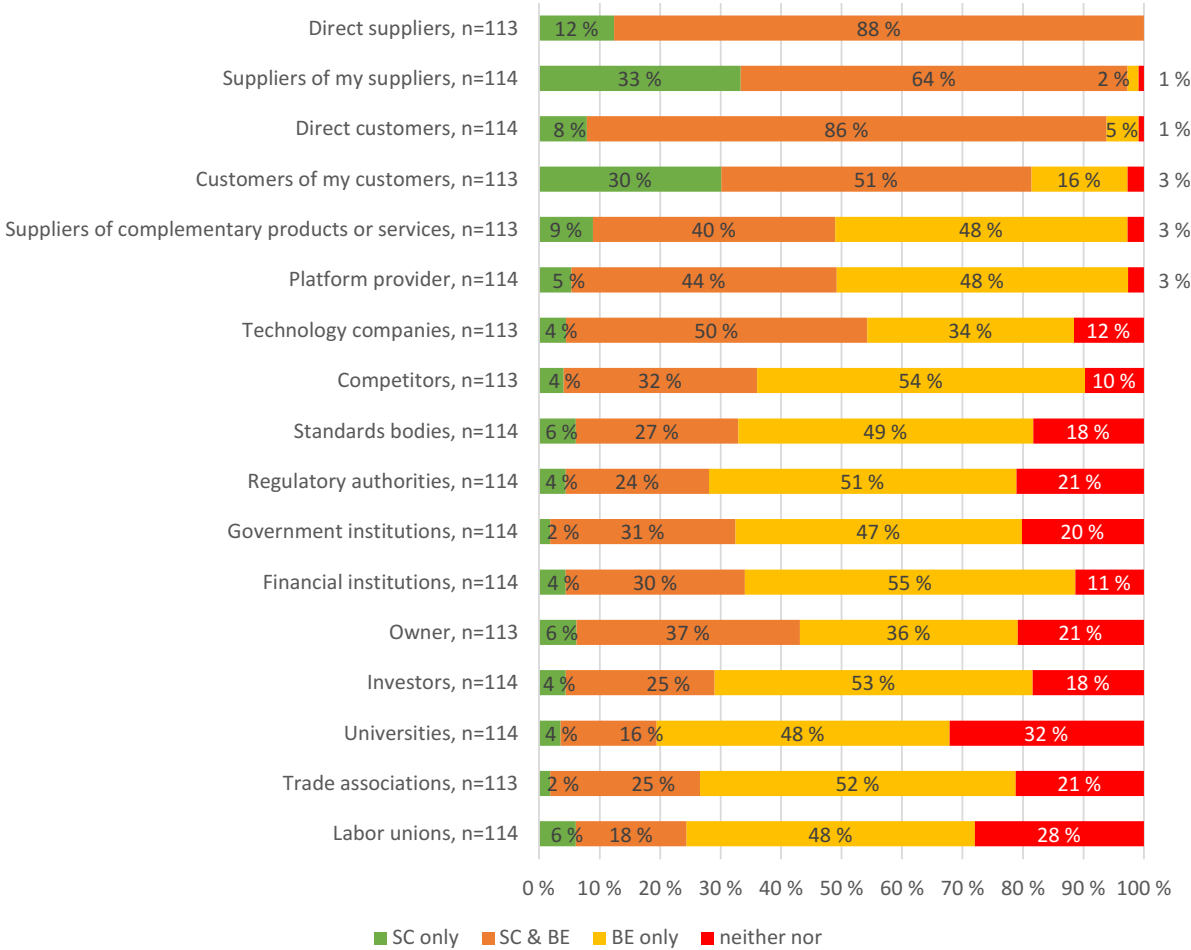


Figure C1. Actors

Table C1. t-Test for Q6

Participants (Avg, SD, n)	Both concepts known (Avg., SD, n)	Only one concept known (Avg., SD, n)	t-test results t(df)=t ratio, Sig.
Direct suppliers (1.12, 0.33, n=113)	1.11, 0.32, n=63	1.14, 0.35, n=49	t(110)=-0.50, p=0.62
Suppliers of my suppliers (1.39, 0.57, n=114)	1.35, 0.60, n=63	1.46, 0.54, n=50	t(111)=-1.02, p=0.31
Direct customers (1.21, 0.57, n=114)	1.17, 0.53, n=63	1.26, 0.63, n=50	t(111)=-0.78, p=0.44
Customers of my customers (1.70, 0.83, n=113)	1.63, 0.83, n=62	1.78, 0.84, n=50	t(111)=-0.95, p=0.35
Suppliers of complementary products or services (2.14, 0.99, n=113)	2.25, 1.00, n=63	1.98, 0.97, n=49	t(110)=-1.46, p=0.15
Platform provider (2.10, 1.01, n=114)	2.16, 1.00, n=63	2.04, 1.03, n=50	t(111)=0.62, p=0.54
Technology companies (2.08, 1.14, n=113)	2.15, 1.19, n=62	2.02, 1.10, n=50	t(110)=0.57, p=0.57
Competitors (2.42, 1.04, n=113)	2.56, 1.00, n=62	2.26, 1.07, n=50	t(110)=1.55, p=0.12
Standards bodies (2.60, 1.07, n=114)	2.75, 1.05, n=63	2.40, 1.09, n=50	t(111)=1.72, p=0.09
Regulatory authorities* (2.69, 1.06, n=114)	2.89, 1.00, n=63	2.48, 1.07, n=50	t(111)=2.09, p=0.04
Government institutions (2.57, 1.13, n=114)	2.70, 1.13, n=63	2.44, 1.11, n=50	t(111)=1.22, p=0.23
Financial institutions (2.47, 1.04, n=114)	2.65, 1.02, n=63	2.28, 1.03, n=50	t(111)=1.91, p=0.06
Owner* (2.40, 1.18, n=113)	2.70, 1.16, n=63	2.04, 1.12, n=49	t(110)=3.03, p=0.00
Investors* (2.65, 1.05, n=114)	2.95, 0.91, n=63	2.30, 1.09, n=50	t(94)=3.40, p=0.00
Universities (2.97, 1.00, n=114)	3.13, 0.87, n=63	2.78, 1.13, n=50	t(90)=1.79, p=0.08
Trade associations* (2.70, 1.07, n=113)	2.97, 0.99, n=62	2.40, 1.07, n=50	t(101)=2.89, p=0.01
Labor unions* (2.85, 1.03, n=114)	3.10, 0.89, n=63	2.58, 1.11, n=50	t(92)=2.67, p=0.01

Legend: * = significant on 0.05-level

Q7 – Type of goods managed by supply chains and/or business ecosystems

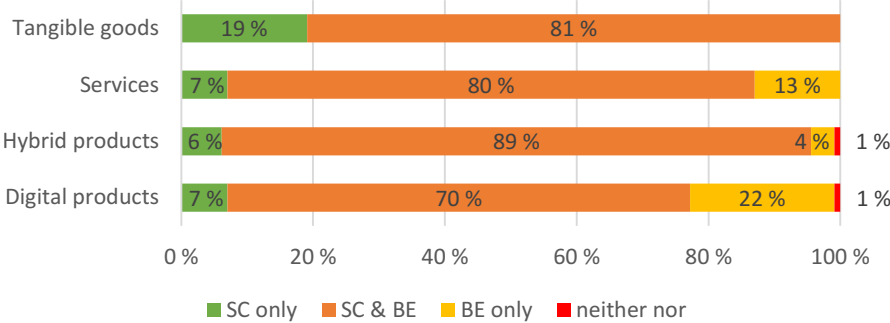


Figure C2. Type of goods

Table C2. t-Test for Q7

Type of goods (Avg, SD, n)	Both concepts known (Avg., SD, n)	Only one concept known (Avg., SD, n)	t-test results t(df)=t ratio, Sig.
Tangible goods (1.19, 0.40, n=115)	1.14, 0.35, n=64	1.26, 0.44, n=50	t(112)=-1.56, p=0.12
Services (1.33, 0.70, n=115)	1.25, 0.64, n=64	1.44, 0.76, n=50	t(112)=-1.42, p=0.16
Hybrid products (1.16, 0.51, n=114)	1.08, 0.33, n=63	1.26, 0.66, n=50	t(111)=-1.76, p=0.08
Digital products (1.54, 0.86, n=114)	1.51, 0.84, n=63	1.58, 0.91, n=50	t(111)=-0.44, p=0.66

Legend: * = significant on 0.05-level

Q8 – Distinction elements

Table C3. t-Test for Q8

Elements (Avg, SD, n)	Both concepts known (Avg., SD, n)	Only one concept known (Avg., SD, n)	t-test results t(df)=t ratio, Sig.
[E1] (1.51, 0.87, n=114)	1.59, 0.93, n=63	1.38, 0.75, n=50	t(110)=1.31, p=0.19
[E2] (1.32, 0.50, n=114)	1.35, 0.54, n=63	1.28, 0.45, n=50	t(111)=0.72, p=0.47
[E3] (1.98, 1.00, n=114)	2.05, 0.99, n=63	1.92, 1.01, n=50	t(111)=0.68, p=0.50
[E4] (1.43, 0.74, n=114)	1.38, 0.58, n=63	1.50, 0.91, n=50	t(79)=-0.81, p=0.42
[E5] (2.17, 1.05, n=114)	2.17, 1.04, n=63	2.18, 1.06, n=50	t(111)=-0.03, p=0.98
[E6] (1.77, 1.01, n=115)	1.86, 1.05, n=64	1.68, 0.96, n=50	t(112)=0.94, p=0.35
[E7] (2.67, 1.21, n=114)	2.57, 1.20, n=63	2.82, 1.21, n=50	t(111)=-1.09, p=0.28
[E8] (2.95, 0.99, n=111)	3.02, 0.96, n=61	2.88, 1.03, n=49	t(108)=0.73, p=0.47
[E9]* (1.86, 0.85, n=111)	2.03, 0.94, n=60	1.64, 0.69, n=50	t(108)=2.46, p=0.02
[E10] (1.59, 0.67, n=111)	1.65, 0.69, n=60	1.54, 0.65, n=50	t(108)=0.86, p=0.39
[E11] (1.99, 0.97, n=111)	2.02, 0.93, n=60	1.98, 1.02, n=50	t(108)=0.20, p=0.84
[E12] (1.16, 0.48, n=112)	1.20, 0.54, n=61	1.12, 0.39, n=50	t(109)=0.84, p=0.40
[E13] (1.86, 1.10, n=111)	1.97, 1.19, n=60	1.70, 0.97, n=50	t(107)=1.29, p=0.20
[E14] (1.69, 0.94, n=113)	1.69, 0.87, n=64	1.69, 1.04, n=48	t(110)=0.00, p=1.00
[E15] (1.42, 0.72, n=114)	1.39, 0.73, n=64	1.45, 0.71, n=49	t(111)=-0.43, p=0.67
[E16] (1.84, 1.01, n=114)	1.92, 1.06, n=64	1.76, 0.95, n=49	t(111)=0.87, p=0.39
[E17] (1.94, 1.03, n=114)	1.97, 1.05, n=64	1.86, 0.98, n=49	t(111)=0.58, p=0.57
[E18] (2.54, 1.61, n=114)	2.63, 1.13, n=64	2.41, 0.19, n=49	t(111)=0.99, p=0.33
[E19] (2.81, 1.08, n=113)	2.81, 1.08, n=63	2.78, 1.00, n=49	t(110)=0.17, p=0.87
[E20] (1.76, 0.98, n=114)	1.83, 1.00, n=64	1.69, 0.96, n=49	t(111)=0.72, p=0.47

Legend: * = significant on 0.05-level

Q9 – Areas of supply chain (SCM) and business ecosystem management (BEM)

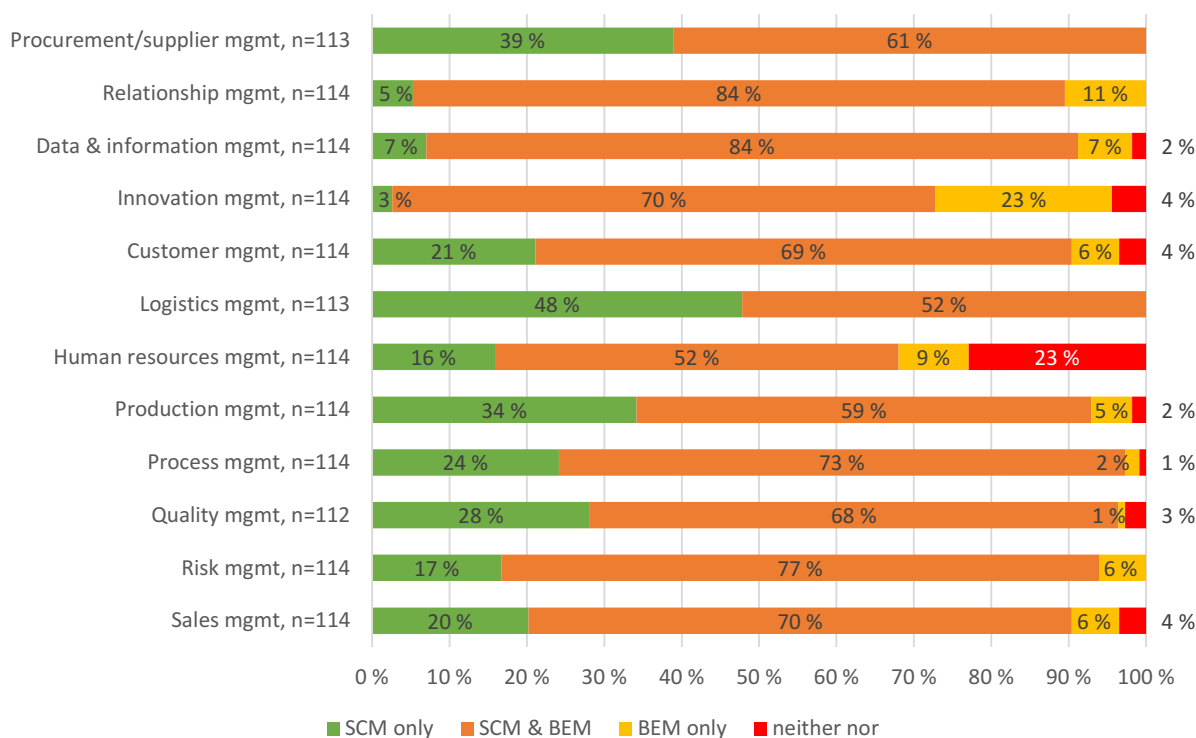


Figure C3. Management areas

Table C4. t-Test for Q9

Mgmt Areas (Avg, SD, n)	Both concepts known (Avg., SD, n)	Only one concept known (Avg., SD, n)	t-test results t(df)=t ratio, Sig.
Procurement/supplier (1.39, 0.49, n=113)	1.44, 0.50, n=63	1.33, 0.47, n=49	t(105)=1.27, p=0.21
Relationship (1.26, 0.64, n=114)	1.31, 0.69, n=64	1.20, 0.58, n=49	t(111)=0.89, p=0.38
Data & information* (1.26, 0.67, n=114)	1.39, 0.79, n=64	1.10, 0.42, n=49	t(100)=2.50, p=0.01
Innovation (1.61, 0.98, n=114)	1.61, 1.02, n=64	1.59, 0.93, n=49	t(111)=0.09, p=0.93
Customer (1.44, 0.77, n=114)	1.50, 0.84, n=64	1.37, 0.67, n=49	t(111)=0.91, p=0.37
Logistics (1.48, 0.50, n=113)	1.55, 0.50, n=64	1.40, 0.49, n=48	t(110)=1.59, p=0.12
Human resources (2.04, 1.24, n=114)	2.09, 1.26, n=64	1.98, 1.23, n=49	t(111)=0.48, p=0.63
Production (1.50, 0.68, n=114)	1.59, 0.73, n=64	1.39, 0.61, n=49	t(111)=1.60, p=0.11
Process* (1.31, 0.55, n=114)	1.41, 0.64, n=64	1.18, 0.39, n=49	t(106)=2.29, p=0.02
Quality* (1.38, 0.65, n=112)	1.52, 0.76, n=63	1.21, 0.41, n=48	t(99)=2.81, p=0.01
Risk (1.29, 0.58, n=114)	1.36, 0.63, n=64	1.20, 0.50, n=49	t(110)=1.47, p=0.15
Sales (1.43, 0.76, n=114)	1.48, 0.78, n=64	1.37, 0.76, n=49	t(111)=0.80, p=0.42

Legend: * = significant on 0.05-level