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REVIEW PAPER

The concept of relatedness in diversification research: review and synthesis

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Abstract
Relatedness has become fundamental to the analysis of corporate diversification and a wide range of strategy research. Its broad definition, however, leaves researchers with substantial leeway in theorizing and operationalizing the relatedness construct. While recent advances have contributed to a more sophisticated understanding of how relatedness creates value, the heterogeneity of scholarly efforts leaves relatedness research in a state of terminological, conceptual, and methodological fragmentation and in need of consolidation. This article seeks to close this research gap by taking stock of the extant literature and providing the first systematic review focused exclusively on related diversification. The review identifies and analyzes 82 peer-reviewed scholarly articles published between 1982 and 2017, providing a critical assessment of these research efforts and proposing a holistic relatedness research framework that can serve as a common foundation for future scholarship. The review concludes by offering eight avenues for future research as a contribution to the theoretical literatures on diversification and resource-based theory.

Keywords Relatedness · Diversification · Resource-based theory

JEL Classification M10 · L25

1 Introduction

Over the past four decades, the construct of relatedness has been widely employed in corporate diversification research to capture the degree of association between two businesses, or their respective resource stocks, to make predictions about the scope, direction, and success of diversification (e.g., Hauschild and Knyphausen-Aufseß 2013; Palich et al. 2000; Wan et al. 2011). Although the original definition

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of relatedness, as devised by Wrigley (1970) and Rumelt (1974), primarily concerned product–market characteristics, the construct soon gained traction under the emerging paradigm of resource-based theory (RBT) put forth by Wernerfelt (1984) and Barney (1991). Given RBT's emphasis on synergies or scope economies as the motivating force behind diversification, relatedness in terms of firm resources provided a particularly fertile ground for the study of diversification and conditioned its dominant understanding in the field of strategic management (Robins and Wiersema 2003). Indeed, Rumelt (1974: 11) had foreshadowed this emphasis on characteristics internal to the firm when he described lines of businesses as being related if they were 'tangibly related to the collective skills and strengths possessed originally by the firm.'

Building on RBT's central tenet that firms diversify to put their surplus resources to use, scholars have examined the relatedness–performance linkage across a multitude of levels of analysis, from the individual business unit to the corporate and industry levels, using a plethora of dimensions (Neffke and Henning 2013). The attempt to measure relatedness quantitatively has given rise to a considerable substream of literature that has set out to quantify the degree of relatedness using various methods (e.g., Fan and Lang 2000). This multiplicity in conceptualizations and approaches has greatly benefitted the scholarly debate and provided evidence that related diversification strategies outperform both single-business strategies and unrelated diversification strategies (e.g., Lubatkin and O'Neill 1987; Markides and Williamson 1994; Nayyar 1992). This finding was popularized as the inverted U-model by Palich et al. (2000), reflecting the curvilinearity of the relationship between diversification and performance. Yet, the precise nature of the relationship remains subject to debate, and the boundaries and interrelations of the relatedness construct itself remain elusive (Wan et al. 2011). Accordingly, Neffke and Henning (2013: 298) argue that '[d]espite the importance of the concept, the definition of relatedness, and the methods for measuring relatedness are often surprisingly imprecise.' Both the theory describing how relatedness creates value and methods of operationalizing and measuring the construct have recently seen new and divergent approaches emerge; these have not yet been systematically evaluated and contrasted. Furthermore, because of the tacit nature of relatedness, particularly in the non-tangible dimensions that have been examined in recent studies (e.g., knowledge, dynamic capabilities, and activities), researchers are left with substantial leeway in theorizing and operationalizing the relatedness construct. As a result, the relatedness literature is in a state of terminological, conceptual, and methodological fragmentation and in need of consolidation (Hauschild and Knyphausen-Aufseß 2013). Wan et al. (2011: 1355) note that '[g]oing forward, this line of research likely will benefit more from employing a more holistic, overall perspective to understanding how a firm's various resource combinations affect its diversification strategy than from studying a particular resource or relatedness one at a time.' This review sets out to close this important research gap and propose a holistic relatedness research framework that can serve as a common foundation and reference point for future scholarship. It focuses on the conceptual question of how relatedness creates value through the provision of synergistic benefits, an issue that is key to advancing relatedness research but that is often treated imprecisely, if at all, in existing studies (Ahuja and Novelli

2017). Arriving at a meaningful relatedness construct requires an understanding of the assumed value-creating mechanism behind relatedness in order to assess the validity and quality of existing relatedness measures, and systematically categorize the plurality of constructs.

Corporate diversification has been the subject of extensive research in the fields of strategic management, finance, and industrial organization (IO) economics. Given this considerable scientific interest, a comprehensive treatment of the subject across all disciplines would go beyond the scope of this review. As mentioned, RBT, with its focus on firm resources and the sharing thereof, became the dominant theoretical framework for examining and expanding the construct (Neffke and Henning 2013). Relatedness thus received the most extensive treatment in the domain of strategic management over the years and considerably less attention in the economics and finance literature (Wan et al. 2011). Accordingly, this review will be limited to the field of strategic management and RBT in particular but will employ supplementary perspectives where appropriate. Owing to its abstract meaning, the term relatedness is imbued with different connotations in the strategic management literature. For instance, the domain of organizational learning developed its distinct interest in relatedness following Cohen and Levinthal's (1990) seminal publication on absorptive capacity. In contrast, this review focuses on the dominant understanding of the term under the paradigm of RBT, referring to relatedness in the context of diversification as coined by Wrigley (1970) and Rumelt (1974).

The scope of this paper is markedly different from that of earlier reviews, most notably Palich et al. (2000), Wan et al. (2011), and, more recently, Ahuja and Novelli (2017). First, whereas other reviews have focused on relatedness as part of a more general treatment of diversification in RBT, this review is the first to focus solely on relatedness. This exclusive focus is enabled by the degree of sophistication in theory and methods facilitated by recent scholarly activity, which merits an individual appraisal. Second, no study has systematically dissected the underlying value-creating mechanism of relatedness. Whereas Ahuja and Novelli (2017) also study the so-called 'micro-mechanisms' behind relatedness and provide a very promising starting point for this line of research, their contribution primarily highlights the difference between benefits and 'antisynergies' or costs of diversification. This review, by contrast, includes an explicit treatment of new notions of value-creation, such as complementarity and redeployability, two discrete sources of value that had not yet fully emerged when previous reviews were conducted, and discusses the implications for the conceptualization and measurement of relatedness.

The remainder of this paper is organized as follows. Section 2 outlines the review agenda, introducing three sub-questions that guide this article. Section 3 outlines the criteria for selecting my literature sample. Section 4 introduces the relatedness research framework; the literature analysis is then conducted following the elements of the framework. Section 5 identifies eight avenues for future relatedness research. Finally, Sect. 6 concludes the article.

2 Review agenda

The goal of this review is to capture, understand, and map the underlying value-creating mechanisms behind relatedness to create a more accurate portrayal of the multifaceted process by which two businesses combine to create value. By capturing the many conceptualizations in which relatedness can impact performance for better or for worse and acknowledging their theoretical strengths and weaknesses, a conceptual frame of reference is created that can be used to both evaluate existing research and guide future scholarship. To achieve this goal, my review agenda consists of the three sub-questions detailed below.

First, any attempt to identify the rationale behind related diversification is futile unless the dimensions within which two businesses can be related are first determined. For that reason, this review begins with the question, 'Which dimensions does relatedness pertain to?' RBT posits that firms will diversify to put their surplus resources to use but remains vague about how resource relatedness should be conceptualized (Hauschild and Knyphausen-Aufseß 2013). As a result, the literature often focuses on one particular aspect or subset of dimensions (e.g., human capital, management capabilities, knowledge, activities) and introduces proprietary distinctions (e.g., operational vs. strategic, tangible vs. intangible). Furthermore, market-based conceptions of relatedness provide a complementary, albeit contrasting, perspective of relatedness based on external characteristics. To what extent these conceptualizations are congruent and whether there is a hierarchy between the dimensions is my first topic of interest.

Second, the way in which performance benefits are expected to materialize through related diversification is addressed in the next sub-question: 'How does relatedness enhance performance?' Many attempts have been made to differentiate types of synergies or propose alternative arguments on how relatedness benefits the diversifying firm. Most notably, complementarity has been introduced as a discrete source of value creation from similarity (e.g., Makri et al. 2010). More recent works have emphasized the process perspective of synergy creation and pointed to ideas such as resource transferability (Speckbacher et al. 2015), resource redeployment (Sakhartov and Folta 2014), and the overlooked distinction between scale-free and non-scale-free resources (Levinthal and Wu 2010). Whether these nascent concepts can be viewed as extensions or alternatives to the classical notion of cross-business synergies and how precisely they unfold deserves our attention as a second aspect of this review.

Finally, the empirical diversification literature that studies relatedness depends on a measure for quantifying the degree to which it is present or absent in a particular combination of businesses. My last question therefore asks, 'How is relatedness appropriately measured?' Clearly, the construction of any relatedness measure depends on the resource dimensions and the theorized synergy creation. As a consequence, the various conceptualizations of relatedness in the literature have engendered a corresponding number of measurement constructs (Bryce and Winter 2009). The challenge of operationalizing relatedness is rooted in RBT's enduring problem that resources are hard to measure, particularly as many are

intangible (Barney et al. 2011). Additionally, as Parmigiani and Mitchell (2009): 1069) point out, the different antecedents of relatedness 'can be difficult to untangle empirically because they often occur jointly'. It would go beyond the scope of this review to methodically appraise the various measurement constructs; this is a review subject in its own right. Instead, I discuss whether the existing constructs are valid operationalizations of the concept they intend to measure.

3 Literature selection

3.1 Search methodology

In the selection and analysis of my sample, I follow Novicevic et al.'s (2008) call for more systematic reviews in the strategy literature and employ a replicable search protocol. Consistent with previous reviews, I employ the systematic approach set forth by David and Han (2004) in their review on transaction cost economics and subsequently applied to the RBT domain by Newbert (2007) and Hauschild and Knyphausen-Aufseß (2013). Contrary to the traditional *narrative* account, which is employed in most management review studies, the *systematic* review methodology explicitly states its selection principles, values and assumptions in an attempt to counteract any biases that may result when the literature is selected through subjective or undisclosed criteria (Tranfield et al. 2003; Newbert 2007). In essence, the systematic review consists of an exhaustive literature search wherein each filtering decision is made transparent so that others may 'see what you have done and so judge the relevance and substantive nature of your review' (Easterby-Smith et al. 2008: 46). The resulting search protocol allows for a replication and critique of the study, a feature that is particularly critical in the dynamic, fragmented and multidisciplinary domain of strategic management research (Durand et al. 2013). Accordingly, the following steps were taken to compile the literature sample in my study:

1. Restrict search to peer-reviewed journal articles to ensure the quality and relevance of the research.
2. Search the following three databases: EBSCO Business Source Complete, JSTOR and ABI/INFORM Complete.
3. Select literature relevant to the topic by searching for articles that contain either the keyword 'relatedness' (or one of the two variants, 'related diversif*' and 'related acquisition') or the two words 'diversification' and 'resource-based' together in the title, abstract or keywords (also allowing for different variations in wording; see Appendix 1 for the detailed search protocol).
4. Ensure substantive relevance by requiring that all three keywords—'relatedness,' 'resource-based' (allowing for the same variations as in step 3) and 'diversification'—appear in the full body of the article.
5. Further ensure substantive relevance with regard to the underlying value-creating mechanism by requiring that at least one of the four keywords 'economies of scope,' 'synergy,' 'complementarity' or 'redeployment' is included in the body of the article.

Table 1 Results from literature search

Filter description	Business source complete results	ABI/inform results	JSTOR results	Total
3. Relatedness or diversification and RBT in abstract or title	1183	1172	2095	4450
4. All three keywords in full text	135	111	10	256
5. Reference to value-creating mechanism	120	104	3	227
6. Elimination of duplicates	–	–	–	181
7. Journal impact factor of > 2	–	–	–	102
8. Elimination of false positives	–	–	–	82

6. Eliminate duplicates that appear in more than one database.
7. Restrict search to high-quality periodicals by requiring a minimum Thompson Reuters Journal Impact Factor of 2.
8. Read the title, abstract and introduction of all articles to eliminate false positives (i.e., articles without substantive theoretical reference to the review topic).

3.2 Results of literature search

The resulting sample consists of 82 articles, as shown in Table 1. This considerable volume, despite the applied search filters outlined above, is testament to the central role the relatedness topic has played over the last four decades in strategic management research. The articles in the sample cover a period of 35 years, with the earliest published in 1982 and the latest in 2017. Over this period, the number of articles published per year has been fairly consistent, with a median of three articles per year. After the publication of the 1991 *Journal of Management* special issue on RBT, informally marking the emergence of the theory into mainstream research, only one year in the sample (2012) did not see any publications on the subject. Most of the articles were found in the following journals: *Strategic Management Journal* (56%), *Academy of Management Journal* (15%), *Organization Science* (7%), *Academy of Management Review* (5%) and *Journal of Management* (4%). The heavily skewed distribution is caused by my focus on journals with a high impact factor but generally seems in line with other reviews on diversification, which also report a high proportion of articles from the abovementioned outlets and the *SMJ* in particular (e.g., Hauschild and Knyphausen-Aufseß 2013).

The selected literature was made accessible for review by coding the respective dimension(s) of relatedness that were investigated in each study, the hypothesized synergistic or other advantages and disadvantages from diversification, and (where applicable) the design and results of any empirical tests, including dependent and independent variables and test results for the hypotheses.

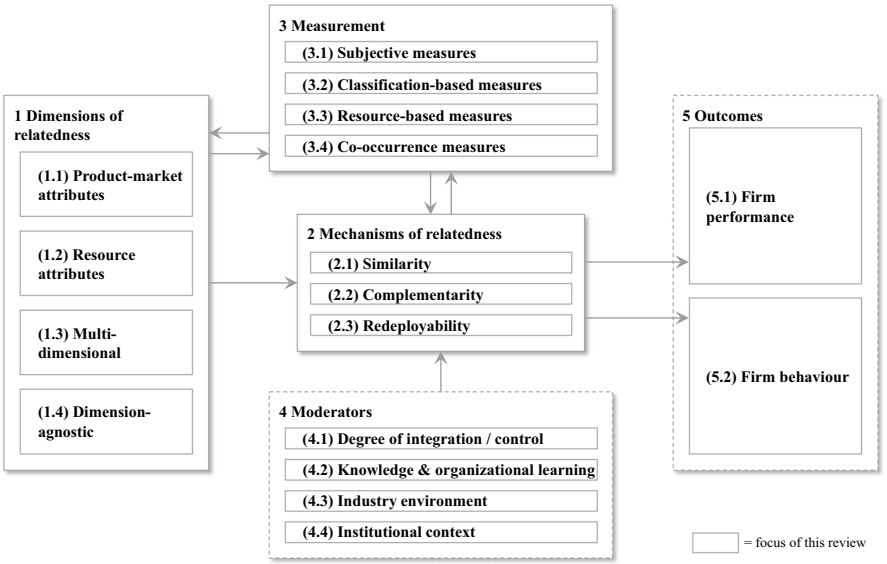

Fig. 1 Relatedness research framework

4 Relatedness in Strategic Management research

Throughout my coding of the literature, the plurality in conceptualizations and operationalizations I encountered confirmed that a literature review was a useful, albeit challenging, endeavor. Ahuja and Novelli (2017) recently arrived at a similar conclusion when they posited that the 'time is ripe for a renewed attack on understanding the relationship between diversification and firm performance' (p. 3). At the same time, the plurality pointed to the need for a thematic clustering within which the scholarship could be discussed and reviewed. My preliminary analysis revealed a number of research themes that can broadly be categorized into five categories: (1) dimensions of relatedness, (2) mechanisms of relatedness, (3) measurement, (4) moderators and (5) outcomes. Each category was further broken down into subcategories, which together form the relatedness research framework I employ throughout this review (see Fig. 1). The framework aptly fits the research questions posed at the outset of this paper. The topics of resource dimensions, value-creating mechanism and the operationalizations of relatedness are addressed in the first three elements of the framework, consecutively. While significant advances have also been made in the latter two elements of the framework—moderators and outcomes—those have been discussed at length elsewhere and are omitted from this literature analysis, primarily for the sake of brevity (e.g., Wan et al. 2011).

Following Campagnolo and Camuffo (2009), I conducted a reference clustering of all 82 studies in my sample based on their prevalent research focus. For each reference, I identified its primary focus across each of the five dimensions in my research framework, allowing me to categorize the extant literature along my

preidentified clusters (see Table 2). When a study did not touch on one or more of the outlined dimensions, the allocation for those dimensions was left blank in the table.

The preliminary analysis of this reference clustering reveals several interesting insights. Overall, a remarkable shift in focus occurs from early relatedness studies to more recent scholarship. The first third of the sample appears homogenous and characterizes relatedness in terms of product–market attributes (1.1), exclusively relying on subjective (3.1) or classification-based measures (3.2) and chiefly examining the effect of relatedness on performance outcomes (5.1). The more recent period, by contrast, features a much more diversified set of studies, with research foci dispersed across all subcategories. Among the moderating influences of relatedness, only the integration/control aspect (4.1) and the industry environment (4.3) have been discussed in the first half of the sample period, while organizational learning and knowledge (4.2) and institutional aspects (4.4) have emerged more recently. With regard to the outcome, the question of how relatedness impacts performance (5.1) yields almost twice the number of studies than do questions focused on behavior-based outcomes (5.2). This focus appears to be particularly pertinent in the early years and is notably absent from the most recent publications.

4.1 Dimensions of relatedness

Fundamental to the relatedness concept are dimensions in which two or more businesses are related. These dimensions determine both the value-creating mechanism involved and the choice of corresponding empirical measure. Relatedness between two firms' knowledge bases, for instance, impacts firm performance in very different ways than operational relatedness and requires a measure that appropriately captures these intangible interrelations.[1] Consequently, the decision about which dimensions to take into consideration (and which ones to omit) will substantially influence research outcomes. In the absence of a dominant relatedness conceptualization, no two sets of relatedness dimensions in the extant literature are identical. This plurality is driven in part by changes in industry structure over the past decades, in which a shift from manufacturing to a service economy changed the scope of dimensions (Sampler 1998). It is also a result of the multifaceted nature of the relatedness construct, which researchers have set out to capture with many conceptualizations and methods (Miller 2006). Generally, however, the following four types of relatedness dimensions can be distinguished.

4.1.1 Product-market attributes

The first set of attributes considers relatedness among businesses' product characteristics or market segments. These *product-market attributes* were first emphasized by

[1] Relatedness at the operating level refers to links between value chain functions, e.g., marketing and production. For long, this was the dominant understanding of the term in the strategy literature following the accentuation of the original Wrigley/Rumelt classification (Grant 1988).

Table 2 References clustering, ordered by year of publication

References	1 Dimension				2 Mechanism			3 Measurement				4 Moderator				5 Outcome	
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2
1. Bettis and Hall (1982)	x				x			x								x	
2. Bettis and Mahajan (1985)	x				x			x								x	
3. Palepu (1985)	x				x				x							x	
4. Hill and Hoskisson (1987)												x					
5. Hoskisson (1987)	x				x			x				x				x	
6. Johnson and Thomas (1987)	x				x			x								x	
7. Kazanjian and Drazin (1987)		x											x				
8. Lubatkin (1987)	x				x				x							x	
9. Lubatkin and O'Neill (1987)	x				x				x							x	
10. Sicherman and Pettway (1987)	x				x				x							x	
11. Singh and Montgomery (1987)		x			x				x							x	
12. Barney (1988)																x	
13. Grant (1988)		x			x											x	
14. Grant and Jammine (1988)	x				x			x								x	
15. Williams et al. (1988)	x				x			x				x					
16. Chatterjee (1990)	x				x				x								x
17. Chatterjee and Lubatkin (1990)	x				x				x							x	
18. Chatterjee and Wernerfelt (1991)	x				x				x								x
19. Davis et al. (1992)	x				x	x		x								x	
20. Mahoney and Pandian (1992)					x												
21. Nayyar (1992)			x		x			x									
22. Harrison et al. (1993)		x			x			x								x	
23. Nayyar (1993a)			x		x			x				x				x	

Table 2 (continued)

References	1 Dimension				2 Mechanism			3 Measurement				4 Moderator				5 Outcome	
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2
24. Nayyar (1993b)			x		x			x				x				x	
25. Nayyar and Kazanjian (1993)					x							x				x	
26. Bruton et al. (1994)	x				x			x						x		x	
27. Farjoun (1994)		x			x					x							x
28. Markides and Williamson (1994)			x		x					x						x	
29. Ilinitch and Zeithaml (1995)		x			x					x						x	
30. Robins and Wiersema (1995)		x			x					x						x	
31. Markides and Williamson (1996)			x		x					x		x				x	
32. Sharma and Kesner (1996)	x				x				x					x		x	
33. Anand and Singh (1997)	x				x				x					x		x	
34. Lubatkin et al. (1997)	x				x			x	x							x	
35. Stimpert and Duhaime (1997)			x		x			x									
36. Farjoun (1998)			x		x				x							x	
37. Sampler (1998)		x															
38. Coff (1999)		x			x					x			x				x
39. Palich and Gomez-Mejia (1999)		x			x											x	
40. St John and Harrison (1999)		x			x			x				x				x	
41. Palich et al. (2000)	x				x			x	x							x	
42. Tsai (2000)			x					x					x				x
43. Ahuja and Katila (2001)		x			x					x			x				x
44. Hansen (2002)		x						x					x				x
45. Park (2003)	x				x				x					x		x	
46. Robins and Wiersema (2003)	x				x				x								

Table 2 (continued)

References	1 Dimension				2 Mechanism			3 Measurement				4 Moderator				5 Outcome	
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2
47. Helfat and Eisenhardt (2004)							x					x					x
48. Peng et al. (2005)		x			x										x		
49. Shayne Gary (2005)												x				x	
50. Tanriverdi (2005)		x			x			x	x				x			x	
51. Tanriverdi and Venkatraman (2005)		x			x			x	x							x	
52. Homburg and Bucerius (2006)			x					x								x	
53. Meyer (2006)					x										x		x
54. Miller (2006)		x				x				x						x	
55. Pehrsson (2006)			x		x			x								x	
56. Tanriverdi (2006)		x			x			x	x							x	
57. Ng (2007)													x			x	
58. Bergh et al. (2008)	x				x				x								x
59. Døving and Gooderham (2008)														x			x
60. Tanriverdi and Lee (2008)		x				x				x						x	
61. Bryce and Winter (2009)				x							x						x
62. Lee and Lieberman (2010)				x	x						x						x
63. Levinthal and Wu (2010)							x							x			x
64. Makri et al. (2010)		x			x	x			x								x
65. Diestre and Rajagopalan (2011)		x			x					x					x		x
66. Wan et al. (2011)					x								x		x	x	
67. Zhou (2011)		x									x	x					x
68. Kim et al. (2013)	x				x				x				x				x
69. Kumar (2013)				x							x					x	

Table 2 (continued)

References	1 Dimension				2 Mechanism			3 Measurement				4 Moderator				5 Outcome	
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2
70. Lien and Klein (2013)				x							x						x
71. Neffke and Henning (2013)		x			x						x						x
72. Ray et al. (2013)	x					x					x					x	
73. Ahuja et al. (2014)		x			x						x		x				x
74. Sakhartov and Folta (2014)							x										
75. Celo and Chacar (2015)				x	x	x					x					x	
76. Sakhartov and Folta (2015)							x										
77. Speckbacher et al. (2015)			x			x		x									x
78. Leten et al. (2016)		x			x					x						x	x
79. Miller and Yang (2016)		x			x					x							x
80. Nocker et al. (2016)	x	x			x			x						x		x	
81. Lieberman et al. (2017)				x			x				x						x
82. Ahuja and Novelli (2017)			x		x				x			x	x	x	x	x	x
Total	25	27	12	6	59	7	5	25	22	12	10	12	11	8	5	47	26

Rumelt (1974), who distinguished among three aspects of product-market relatedness: '(1) relationships among markets served and distribution systems; (2) relationships based on similar production technologies; or (3) the exploitation of science-based research' (p. 17). Product-market attributes constitute the most commonly employed dimension in the literature, alongside resource attributes, although their popularity gradually waned over the last two decades. Particularly IO scholars rely on these attributes, often borrowing preconceived relatedness classifications such as the Federal Trade Commission's (FTC's) large merger series (e.g., Chatterjee and Lubatkin 1990; Lubatkin 1987; Lubatkin and O'Neill 1987) or, more commonly, the SIC classification scheme (e.g., Chatterjee 1990; Palepu 1985; Sharma and Kesner 1996; Sicherman and Pettway 1987). Both systems connect industries or mergers based on a number of product–market linkages, ranging from similarities in raw material inputs to product use and end customers (Robins and Wiersema 1995). While the drawbacks of these classifications were recognized early on (e.g., Lubatkin et al. 1997; for a detailed discussion, see. Ch. 4.3), the availability and apparent objectivity that helped popularize the use of these classifications also contributed to the predominantly market-based view of relatedness of early research. Other researchers, most notably Wrigley (1970) and Rumelt (1974), developed their proprietary typologies which, like the SIC system, were based on relationships among products, markets and technologies. Both the predefined and proprietary product-market classifications look for commonalities not only in the firm's production capabilities but also, and especially, in terms of external market characteristics. This emphasis gradually shifted with the emergence of RBT in the 1990s, when more resource-based ways of conceptualizing relatedness were introduced to diversification research (Robins and Wiersema 2003). While RBT highlights the idiosyncratic resource base of the firm as the primary lens for studying relatedness, product–market attributes remain an important complementary perspective by which to examine the synergistic benefits of diversification.

4.1.2 Resource attributes

Based on RBT's central tenet that valuable and rare resources can create a sustained competitive advantage (Barney 1988), scholars have increasingly focused the analysis of diversification of the firm's resource base. With synergy or scope economies as the motivating force behind diversification in RBT, the issue of resource relatedness moved to the center of scholarly attention (Robins and Wiersema 2003). Researchers focused their analysis on a wide range of resources, broadly falling into three categories: human expertise and knowledge relatedness (Ahuja and Katila 2001; Farjoun 1994; Miller 2006; Neffke and Henning 2013), technological/IT relatedness (Leten et al. 2016; Pehrsson 2006; Tanriverdi 2006; Tanriverdi and Venkatraman 2005) and soft factors such as firm culture (Palich and Gomez-Mejia 1999) or dominant managerial logic (Grant 1988). With no readily available measures for quantifying relatedness in these dimensions, researchers relied on more innovative ways to capture the underlying concept, including patent counts (Ahuja and Katila 2001), patent citations (Miller 2006), occupational profiles (Farjoun 1994), cross-industry labor flows (Neffke and Henning 2013) and R&D and capital expenditure (Harrison et al.

1993). However, as Bryce and Winter (2009) point out, identifying which of a firm's resources matter most for competitive advantage is no easy task and makes generalizations to other industries or empirical contexts difficult. Even if the central resource class were correctly identified, any single resource-based indicator will likely forfeit its predictive power beyond the industry in which a firm operates. As a result, though the described measures have a stronger conceptual link to RBT, it remains difficult to prove that the resources examined were the only or even the most critical strategic components of the diversification outcome.

4.1.3 Multi-dimensional

A third group of researchers proclaims that relatedness should be viewed as a multidimensional construct reflecting both product–market and resource attributes as well as other factors, such as the firm's value chain (Farjoun 1998; Nayyar 1993b; Pehrsson 2006; St John and Harrison 1999; Stimpert and Duhaime 1997). By incorporating a multitude of aspects both internal and external to the firm, the researchers acknowledge the complexity of the relatedness construct and evade the challenge of identifying the single most relevant resource category. These multidimensional conceptualizations are most commonly assessed by surveying managers' perceptions and clustering them thematically. Stimpert and Duhaime (1997), for example, distinguish among differentiation and financial and commodity relatedness, whereas Markides and Williamson (1994) group their assessment into five asset classes: customer, channel, input, process and market knowledge assets.

The apparent strength of this approach—that it unpacks the concept of relatedness and examines its individual dimensions—is also its main weakness. The granular data required to assess all dimensions make data retrieval difficult and hamper comparability, in contrast to universally available classification schemes such as the SIC system. Additionally, aggregating individual dimensions to meaningful clusters requires researchers' value judgments about which dimensions are most relevant for diversification success and how they ought to be weighed concerning their individual impact, leaving the problem the researchers set out to address unresolved. Despite its shortcomings, however, this approach answers the popular call for a construct that reflects the multidimensionality of resource relatedness and has received strong support in more recent contributions (e.g., Ahuja and Novelli 2017; Miller 2006; Pehrsson 2006).

4.1.4 Dimension-agnostic/phenomenological

The fourth and most recent approach to identifying relatedness between industries aims to overcome the shortcoming of previous relatedness conceptualizations by remaining agnostic about the particular resource types that combine to create value (Bryce and Winter 2009; Lien and Klein 2009, 2013). The dimension-agnostic approach circumvents the primary shortcoming of prior measures by simply measuring which pairs of industries co-occur most frequently in corporate portfolios (Bryce and Winter 2009). The pairs that are most commonly observed are presumed to have the highest degree of relatedness. This approach is thus phenomenological,

as it relates empirical observations of apparent relatedness but is not underpinned by resource-based considerations about the types of synergistic benefits in related diversification. Remaining dimension-agnostic has several advantages. Most importantly, it avoids the risk of missing important aspects of relatedness by focusing on an individual resource class. Moreover, it provides a measure that can be easily compared across industries. Despite its elegance, however, scholars have criticized the approach for risking becoming tautological, as relatedness is simply assumed in all examined portfolios (Neffke and Henning 2013). This precludes the possibility of other reasons for industries to co-occur under the same corporate roof, such as historical evolution, political reasons, or risk diversification, to name but a few. Additionally, the approach by its very nature remains silent on the sources of synergy that arise in related portfolios, leaving us with an unsatisfactory understanding of the underlying mechanisms of relatedness.

4.2 Mechanisms of relatedness

The dimensions along which two businesses can be related yield a concomitant variety of notions of how a related diversification strategy is assumed to outperform an unrelated one. These differences in the way relatedness creates value are captured in what I term the *mechanisms of relatedness*. Similar to the dimensions of the relatedness construct, the understanding of the mechanisms of relatedness has evolved significantly over the four decades of resource-based research.

The value of a diversification strategy is closely connected to the underlying diversification logic. Finance, industrial organization economics and strategic management studies all examine the diversification–performance linkage and postulate different reasons for why firms diversify. While industrial organization economics primarily highlights market power as a driver of diversification, financial economics emphasizes the idea of risk diversification in the context of efficient markets (Montgomery 1994). Both disciplines, however, follow the general assumption of relative market perfection and thus view diversification as an unnecessary or even adverse outcome (Wan et al. 2011). Building on agency theory, which posits that managers pursue empire-building activities to the detriment of their shareholders, diversification is viewed as a manifestation of agency costs (Bryce and Winter 2009). Unsurprisingly, neither discipline finds compelling evidence for a positive relationship between diversification and performance (e.g., Miller 2006; Palepu 1985). Additionally, these motives provide no reason to favor related over unrelated diversification. This situation changed with the emergence of RBT in strategic management, which focuses on the sharing of resources and capabilities as the key reason for diversification. Robins and Wiersema (1995: 279) claim that 'the rationale for multi-business organizations ultimately lies in sharing strategic capabilities among businesses. In the absence of shared firm-specific strategic assets, a corporation can be expected to perform less well than the sum of its separate businesses.' It is the sharing of resources, therefore, that moved the idea of relatedness into the center of attention among diversification scholars (Wan et al. 2011).

The exploitation of some kind of resource sharing between businesses has been captured by scholars via a host of technical terms, chief of among them 'synergy' (Ansoff 1965; Porter 1987), 'economies of scale and scope' (Teece 1980) and 'complementarity' (Milgrom and Roberts 1995). Amid this large and growing body of terminology, the research provides no clear distinctions concerning the precise value-creating mechanism that they set out to examine, at times even using terms interchangeably (Tanriverdi and Venkatraman 2005). Prior to reviewing the different types of relatedness in the sample, a terminological clarification of the key terms is required. In fact, as I will argue later, future progress in relatedness research critically depends on the adoption of more formal definitions of these terms if we are to overcome current shortcomings. In Table 3, I therefore propose a conceptual distinction for the key terminology in the context of relatedness as the basis for the ensuing discussion. The conceptualization merges the works of two different groups of scholars, who have each introduced an important analytical distinction concerning the mechanism of relatedness and the associated value-creating mechanism. On the one hand, Harrison et al. (1991, 2001) draw attention to the difference between similarity and complementarity as two discrete sources of value, arguing that distinct benefits accrue from combining similar and dissimilar resources. On the other hand, Helfat and Eisenhardt (2004) and Sakhartov and Folta (2014, 2015) introduce a temporal dimension to resource sharing by identifying benefits not only from the contemporaneous sharing of resources but from the sequential redeployment of resources from one use to another. Merging these distinctions to attain a holistic picture of relatedness, three different mechanisms of relatedness can be discerned with different synergistic benefits: (1) similarity, (2) complementarity and (3) redeployability (see Fig. 2). While each mechanism has received considerable attention, no joint treatment of all three mechanisms of relatedness and their differentiation has yet been conducted.

4.2.1 Similarity

Similarity is the most commonly perceived mechanism of relatedness. It refers to the combination of identical tangible and intangible resources (e.g., production inputs, information, culture, dominant logic) to achieve economies of scale and scope. These can occur at the operational level (e.g., a common factory for multiple products) or at the corporate level (shared marketing or human resource function). Performance gains through similarity commonly materialize in the form of reduced per-unit costs. Similarity in resource allocations has also been considered as an indication of strategic similarity, which can yield synergistic benefits for managers, as critical knowledge and information can be used across both businesses (Harrison et al. 1991).

Most early diversification studies equate relatedness with similarity, as is reflected in the frequent use of preexisting classifications such as the SIC system, which are based on product–market similarities as opposed to other mechanisms of relatedness. This can be partially attributed to the fact that similarity of resources can be more easily detected than, for instance, complementarity. Some scholars have argued that the lack of evidence of a positive relationship between related diversification

Table 3 Conceptual distinction of extant relatedness terminology

1 Synergy		
Definition: Value and performance of two companies combined will be greater than the sum of their individual parts ('2 + 2 = 5-effect'; Ansoff 1965)		
In relatedness context: Umbrella term encapsulating any performance effects arising from similarity, complementarity, redeployability or other potential types of relatedness		
2a Similarity	**2b Complementarity**	**2c Redeployability**
Definition: Extent to which a business' resources are comparable to another's in terms of type and amount.	*Definition*: Economic concept arising when doing more of one activity increases the returns from doing more of another activity (Teece 1986; Milgrom and Roberts 1995)	*Definition*: Ability to withdraw resources from one use and transfer them to another
In relatedness context: Value realized from *intra*-temporal sharing of *similar* resources	*In relatedness context*: Value realized from *intra*-temporal sharing of *dissimilar* resources (Helfat and Eisenhardt 2004)	*In relatedness context*: Value realized from *inter*-temporal sharing, i.e., redeployment, of resources (Helfat and Eisenhardt 2004)
Benefits: Reduction of per unit costs by sharing of activities (production, R&D, marketing) and elimination of redundancies	*Benefits*: Cross-pollinating combinations of knowledge, skills & technology	*Benefits*: Reduction of sunk costs, lowered barriers to entry
3 Economies of scope		
Definition: Cost advantages attained by sharing assets in the production of multiple products (Teece 1980; Panzar and Willig 1981)		
In relatedness context: Often used interchangeably with synergy; some scholars differentiate the sub-additive nature of scope economies from the super-additive nature of synergy (e.g., Tanriverdi and Venkatraman 2005)		
Applicable 2a–2c:		
Yes	Yes	Yes
4 Economies of scale		
Definition: Cost advantages that arise with increased output of a product (Teece 1980)		
In relatedness context: Not commonly subject of relatedness research, as scale economies do not involve asset sharing but rather describe the cost behavior of a single product line		
Applicable 2a–2c:		
Yes	Potentially	No

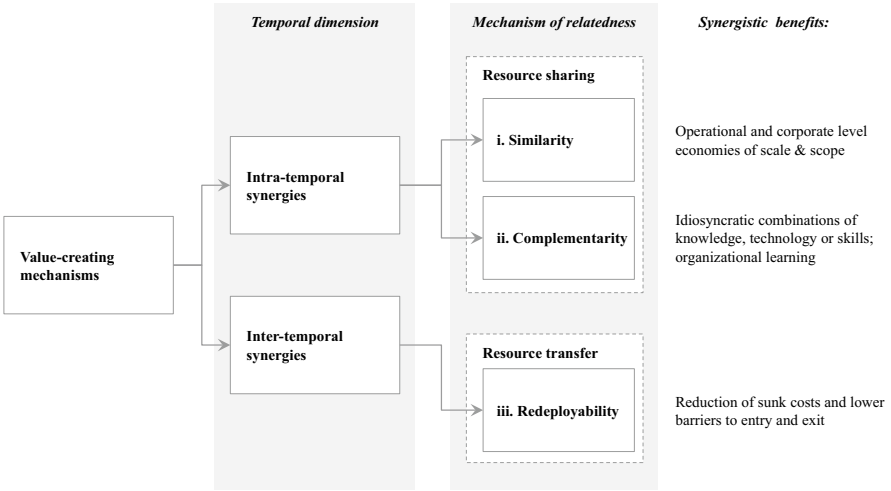

Fig. 2 Decomposition of the mechanisms of relatedness

and performance may stem from mistaking similarity as the only or primary form of relatedness (Harrison et al. 1991). Because synergistic benefits arising from similarity are easily observable and not unique or inimitable, they will likely not serve as the basis for a sustained competitive advantage. Makri et al. (2010) point to the risk that a high degree of similarity can negatively impact the two businesses' ability to learn from each other.

Although synergistic benefits from similarity can be subadditive or superadditive (i.e. they can either reduce costs or increase revenue), most studies in the sample associate them primarily with cost reduction benefits. The net benefit from relatedness in similarity also depends, of course, on its associated costs or diseconomies. Surprisingly, however, little formal treatment of these costs has appeared in the RBT literature. Kumar (2013) and Zhou (2011) present two notable exceptions in the sample, pointing to the bureaucratic costs of coordination and further indirect costs such as conflicts of interest, subsidization and exertion of power. Beyond that, Ahuja and Novelli's (2017) treatment of dissynergies offers a comprehensive list of potential costs. However, an empirical assessment of these different factors and their individual contributions to performance is difficult and has not yet been attempted.

4.2.2 Complementarity

Complementarity refers to the unique combination of resources such as knowledge, technology, or skills to achieve synergistic benefits. Complementarity is often found in the combination of intangible resources, specialized human capital (Farjoun 1998), managerial know-how (Prahalad and Bettis 1986), or technological know-how (Robins and Wiersema 1995). While some scholars have equated relatedness with similarity and thus subscribe to a more narrow definition of the term (e.g., Harrison et al. 1991, 2001; Tanriverdi and Venkatraman 2005; Tanriverdi 2006), the

majority of scholars locate complementarity under the umbrella of relatedness (e.g., Bryce and Winter 2009; Fan and Lang 2000; Makri et al. 2010; Ray et al. 2013; Speckbacher et al. 2015). This strand of literature rightly acknowledges that synergies do not only arise from similarities but also from complementarities. Relatedness, as the precursor of synergies, accordingly encompasses both these mechanisms. Makri et al. (2010) even go so far as to argue that complementarity has long been tacitly included in the understanding of relatedness, only that many scholars did not explicitly distinguish it from similarity and used the terms interchangeably (e.g., Davis et al. 1992; Farjoun 1998). The difficulty of untangling the two mechanisms can be illustrated with an example. When car manufacturer BMW purchased the Mini brand as part of its acquisition of the Rover Group in 1994, was this diversification move primarily similar in nature, as it occurred within the same industry, or was it complementary, as Mini attracted a new, younger customer segment that the high-end brand positioning of BMW did not speak to? Surely, either view is plausible. The more encompassing understanding of relatedness also revives the meaning with which the word was imbued at its inception. In his definition, Rumelt (1974) used the abstract term 'relationships' among markets, technologies, distribution channels, and so forth, to capture relatedness. This view is also very much in line with RBT, which highlights the broad 'interconnectedness of asset stocks' (Dierickx and Cool 1989: 1508) as the primary determinant of sustained competitive advantage.

The more formal treatment of complementarity is facilitated by new attempts to formalize the mechanism in the context of diversification. Makri et al. (2010) define complementarity as the 'degree to which…problem solving focuses on different narrowly defined areas of knowledge within a broadly defined area of knowledge that they share.' (p. 606). This compares with similarity, which 'focuses on the same narrowly defined areas of knowledge'. This definition fits with the broader meaning of complementarity in economics, in which combining one input with another increases the marginal returns from that input (Milgrom and Roberts 1990; Teece 1986). The central difference to similarity is that, in complementarity, two unidentical resources combine to create synergistic value. This makes resource complementarity markedly more difficult to identify ex ante and arguably more difficult to imitate because complementary interrelationships are often tacit, intangible, or unobservable and therefore idiosyncratic (Bryce and Winter 2009). As a result, synergistic benefits from relatedness via complementarity are seen to be more likely to influence firm performance than are those via similarity. Examinations of complementarity as a discrete source of value in diversification seem to confirm this idea and have found significant positive effects on performance (e.g., Harrison et al. 2001; Hitt et al. 1998).

4.2.3 Redeployability

A number of recent studies have argued that theory about value derived from related diversification is incomplete (Helfat and Eisenhardt 2004; Lieberman et al. 2017; Sakhartov 2017; Sakhartov and Folta 2014, 2015). By introducing a temporal dimension to the sharing of resources, a third mechanism of

relatedness, redeployability, is proposed as a discrete driver of value. While similarity and complementarity both refer to the contemporaneous sharing of a resource, redeployability means the sequential transfer of a resource from one use to another (Helfat and Eisenhardt 2004). In this context, a resource is redeployable when it is 'usage-flexible' and can be applied for many different businesses (Lieberman et al. 2017). The idea resembles the concept of 'fungibility' proposed by Anand and Singh (1997), which denotes the applicability of a resource to many businesses. This wide-ranging applicability does not necessarily require similarity or complementarity. It is rather an 'attribute of a resource that facilitates its application to different organizational and market settings' (Anand and Singh 1997: 101). Besides fungibility, redeployability further depends on the absence of internal barriers to transfer the resources and capabilities within the organization (Speckbacher et al. 2015). Since redeployment involves the withdrawal of resources, it is pertinent only to resources with limited capacity (Bryce and Winter 2009). To capture this difference, Levinthal and Wu (2010) draw a distinction between resources with unlimited ('scale-free') and limited ('non-scale free') capacity.

The precise value-creation mechanism of redeployability is laid out by Lieberman et al. (2017), who merge RBT with the economic theory of sunk cost (Dixit 1989, 1992). A sunk cost is 'an expenditure [that] cannot be recouped if the action is reversed at a later date' (Dixit 1992: 108). As diversification, the entering of new businesses, is associated with significant upfront investment costs, the redeployment option can reduce the amount that will be irrevocable upon exit. Accordingly, a firm's entry and exit into new businesses is facilitated when redeployability is high. With low internal transactions costs, the resources can be allocated to those applications with the greatest return advantage instead of divesting them externally (Sakhartov and Folta 2015).

Because it involves the sequential sharing of resources, Helfat and Eisenhardt (2004) refer to the value derived from redeployability as 'inter-temporal economies of scope.' They extend the notion of relatedness with a dynamic dimension in comparison to the static benefits of contemporaneous resource sharing. Redeployability does not only differ in terms of the temporal dimension it introduces, it is also associated with different outcomes and dissimilar trade-offs, as the discussion of sunk costs, transfer barriers, and fungibility illustrates (Sakhartov and Folta 2014). It thus critically expands our understanding of synergies in the context of diversification by highlighting a hitherto largely ignored type of scope economies (Sakhartov 2017). While the three mechanisms of relatedness all have discrete value-creating mechanisms and are thus important to differentiate analytically, this often proves to be challenging in practice. This is aptly illustrated by Sakhartov and Folta (2014): 1782, who note that 'empirical attempts to disentangle synergy effects from redeployability effects may be impossible, or noisy at best.' Redeployability seems to induce lower costs than the two mechanisms of contemporaneous resource sharing because no centralized organizational structure is required to reap its benefits (Helfat and Eisenhardt 2004).

4.3 Measurement

Extensive scholarship has attempted the 'Herculean task' (Neffke and Henning 2013: 298) of operationalizing relatedness in the form of a categorical or continuous measure. Three factors contribute to the magnitude of this challenge.

First, all empirical relatedness research under RBT is confronted with the difficulty of characterizing firm resources, which are often bundled, tacit, intangible or unobservable (Bryce and Winter 2009; Peteraf 1993; Rumelt 1984). This critically limits the explanatory power of any measure based on external, often crude, firm-level data. Second, because relatedness is multi-dimensional and as different dimensions apply in different contexts, any generalizations across industries or even across firms within the same line of business will have limited validity when the significance of the measured dimensions between those industries differs (Neffke and Henning 2013). Third, improvements in relatedness measurement have largely been driven by methodological advances; however, as the relatedness construct has undergone significant conceptual changes (as described in Ch. 4.1 and 4.2), measurement did not always follow suit and failed to provide methods tied closely to new theory (Miller 2006). Concerning the current status of scholarship in this area, Robins and Wiersema (2003: 45) submit the following: 'Diversification measures that were developed in prior decades for different research purposes are routinely used to analyze relatedness in contemporary studies. This growing disjunction between theory and method has opened the door to problems of content validity that are only beginning to attract the attention of researchers.'

Overall, however, the lively scholarly debate around this topic has yielded an impressive plethora of highly sophisticated measurement procedures, each with its own advantages and disadvantages, the most important of which are outlined below.

4.3.1 Subjective measures

Subjective measures assess the degree of relatedness based on the qualitative and quantitative appraisal of an individual or group of people (Pehrsson 2006). Two types of subjective measures are frequently observed, those based on researcher assessments and those based on surveyed managerial perceptions. Unlike most other approaches, subjective measures are often not continuous but categorical.

The archetype of all subjective assessments is the foundational Rumelt/Wrigley typology. Rumelt (1974) differentiates among nine categories of businesses from vertically integrated to entirely unrelated. These categories provided the basis for much of the early scholarship on diversification and served as a reference point for decades (e.g., Bettis and Hall 1982; Bettis and Mahajan 1985; Bruton et al. 1994; Grant and Jammine 1988; Hoskisson 1987; Johnson and Thomas 1987; Lubatkin et al. 1997). Due to their careful definitions and individual considerations of each firm, the typology certainly exhibits a high level of content validity (Pehrsson 2006). However, transferring a subjective measurement of this kind from the original sample ($n = 80$) to other, larger samples is impractical. Additionally, as Hoskisson et al. (1993) note, the categories resemble different diversification types rather than varying degrees of relatedness. Other scholars have proposed proprietary subjective

classifications, both categorical (Williams et al. 1988) and continuous (Harrison et al. 1993; St John and Harrison 1999). Nocker et al. (2016) perhaps provide the most comprehensive of these efforts by constructing two proprietary measures of customer and technological relatedness in a laudable attempt to construct a replicable, multidimensional measure based on secondary data. However, their selection of dimensions is based solely on the researchers' discretion and not underpinned by a theoretical framework, arguably harming its chances of adoption.

Another popular type of subjective measure relies on managerial perceptions to assess relatedness (Davis et al. 1992; Hansen 2002; Homburg and Bucerius 2006; Nayyar 1992, 1993a, 1993b; Pehrsson 2006; Stimpert and Duhaime 1997; Speckbacher et al. 2015; Tanriverdi 2005, 2006; Tanriverdi and Venkatraman 2005; Tsai 2000). Based on the notion that a firm's management is ultimately responsible for key functions such as resource allocation, strategy formulation and diversification decisions, this approach holds that internal managerial knowledge will reflect 'actual' relatedness better than external assessments will (Nayyar 1993b). Usually based on interviews or surveys for data collection, this approach similarly aims for accuracy and content validity, yet this comes at the expense of implementational effort and generalizability. In addition, management's conceptualization of relatedness does not necessarily reflect actual relatedness more accurately and may be biased or idiosyncratic (Stimpert and Duhaime 1997).

4.3.2 Classification-based measures

Classification-based measures vary in their design but, together, form the most frequently used approach to quantifying relatedness. With few exceptions (Anand and Singh 1997; Bergh et al. 2008), almost all classification-based measures are continuous, allowing for more nuanced statistical analysis than their categorical alternative. The other factor contributing to their attractiveness is data availability, as they rely on existing classifications schemes, such as the Federal Trade Commission's large merger series (1948–1979), the ubiquitous Standard Industrial Classification (SIC) system, its 1997 successor, the North American Industry Classification System (NAICS) or its European counterpart, the *Nomenclature statistique des activités économiques dans la Communauté européenne* (NACE).

Typically, these systems classify industries into hierarchically nested categories, with numbers representing each hierarchical level. A numerical code locates an industry in a high-level sector, a subsector and subsubsectors. Relatedness can be inferred from the number of digits any two industries share. As Bryce and Winter (2009: 1571) note, however, this process 'implicitly relies on the designers of the SIC [or other] system to have already answered the basic question [of relatedness]'. The two most widely used classification-based measures are the related component of entropy index (Farjoun 1994, 1998; Kim et al. 2013; Nayyar 1992, 1993a; Palich et al. 2000; Palepu 1985; Ray et al. 2013; Robins and Wiersema 2003; Stimpert and Duhaime 1997), first calculated by Jacquemin and Berry (1979), and the concentric index (Davis and Duhaime 1992; Robins and Wiersema 2003; Sharma and Kesner 1996), an adaptation of the Herfindahl index that Caves et al. (1980) developed in the context of industrial organization. Despite several methodical differences, both

measures compute the distribution of sales across different hierarchy levels to determine a relatedness score between two businesses.

While the methodological nuances of these measures alone are worthy of review, this goes beyond the scope of this paper (for a detailed analysis of both indices, see Robins and Wiersema 1995, 2003). Suffice it to say that researchers tend to agree that reliance on a predetermined classification has serious shortcomings (Neffke and Henning 2013). In fact, the realization that the SIC systems and its counterparts offer only limited insights into the interrelationships between firms is nothing new (Teece 1982). Nevertheless, as Lubatkin (1987: 41) acknowledges, these types of classifications are the 'only readily available objective measure of…relatedness.' Despite this availability, the reliance on these classifications to reflect the aforementioned dimensions and mechanisms of relatedness is very hard to justify (Neffke and Henning 2013). The SIC system, the most frequently used scheme, was developed for macroeconomic analysis based on product–market linkages such as raw material input, product use and end customers. In addition to the conceptual gap to RBT's emphasis on strategic resources, this can lead to unintuitive groupings or divisions of industries (Robins and Wiersema 1995). A probing of the computational method behind the entropy and concentric indices has also found strong correlations with other aspects of diversification, such as the number of businesses in a portfolio and the size of the dominant business, raising doubts about the methods themselves, independent of the underlying classification scheme (Robins and Wiersema 2003).

4.3.3 Resource-based measures

Another quantitative approach to measuring relatedness uses resource-based indicators to assess the degree of commonality among firms. This requires the ex ante identification of one or more strategically important resources that can confer a competitive advantage (Lien and Klein 2009). As this advantage often stems from tacit, difficult-to-imitate capabilities, resource-based indicators tend to reflect intangible assets. These can be difficult to measure, however, which is why scholars usually resort to an indirect indicator (Farjoun 1994). As today's wide range of industries engenders an equally large number of strategically relevant resources, scholars have proposed a wide variety of indicators. Early examples include occupational profiles (Farjoun 1994) and patterns of technology flow (Robins and Wiersema 1995), both assumed to reflect common underlying capabilities. More recent work has extended this array with other innovative proxies, such as patent count (Ahuja and Katila 2001), patent citation count (Miller 2006), chemical emissions (Diestre and Rajagopalan 2011), cross-industry labor flows (Neffke and Henning 2013), R&D and capital expenditure (Harrison et al. 1993) and value chain similarity (Ilinitch and Zeithaml 1995). The advantages of this approach are obvious. Continuous resource-based indicators lend themselves to empirical analysis similar to classification-based measures but do not rely on predetermined systems to assess relatedness. Additionally, the explicit focus on firm resources is argued to provide a stronger conceptual link to RBT than the earlier methods (Robins and Wiersema 1995). However, this approach is not without its drawbacks. Most importantly, the identification of the most critical resource for competitive advantage is difficult and strongly inhibits

generalizability (Bryce and Winter 2009). As a result, Neffke and Henning (2013: 301) attribute to this type of indicator 'some bias because the strategic relevance of a given resource differs from one industry to the next.'

4.3.4 Co-occurrence measures

The fourth and final approach to measuring relatedness closely corresponds to the phenomenological or dimension-agnostic conceptualization of relatedness, which has emerged only recently (Bryce and Winter 2009; Celo and Chacar 2015; Lien and Klein 2013; Zhou 2011). Building on Stigler's (1968) survivor principle, this approach presumes that patterns of industry combinations in existing firm portfolios are coherent and therefore a good indicator of which industries are related. Relatedness is thus identified as outcome-based, measured by the co-occurrence of industries in corporate portfolios (Neffke and Henning 2013). Building on the coherence methodology introduced by Teece et al. (1994), Bryce and Winter (2009) take this idea furthest by developing a general interindustry relatedness index based on an extensive 1997 census of US manufacturing firms.

However, despite the appeal of the idea to remain dimension-agnostic, the approach has been heavily criticized for its risk of being tautological (Neffke and Henning 2013). The survivor principle simply assumes that all observed portfolios are coherent and does not allow a way for this postulation to be tested. Bryce and Winter (2009) readily admit that other factors, such as random effects or organization inertia, will also shape portfolio composition. Additionally, even if the co-occurrence measure correctly identifies related firms, the method would remain silent on the underlying value-creating mechanisms or sources of synergy.

As the discussion shows, the four approaches to relatedness measurement are faced with critical trade-offs. While subjective and resource-based measures have a strong claim to content validity, either by identifying the key resource for firm performance in a given industry or by building on a multidimensional and nuanced assessment of relatedness, they both fall short in terms of data availability and generalizability. Subjective assessments are difficult to replicate or extend to other industries, as they depend on the assessment of researchers or professionals from that industry. Likewise, resource-based indicators lose their predictive potential when extended to another empirical setting, where success is determined by other key resources. In stark contrast, classification-based and co-occurrence measures are often built on readily available datasets and across many industries, yet, by design, they lack the degree of content validity that their counterparts can claim. None of the current measures provides an explicit treatment of different mechanisms of relatedness in the form of complementarity or redeployability as discrete mechanisms of relatedness. Only once these various mechanisms are measured individually will the effect of relatedness on firm performance be uncovered definitively.

The preceeding chapter and its subchapters, structured along the elements of the relatedness research framework, served to review the key issues and developments in relatedness research in strategic management and related disciplines. The section below will synthesize the shortcomings and propose opportunities for future relatedness research.

5 Shortcomings and avenues for future relatedness research

This review has sought to map the current research landscape on relatedness guided by three subquestions, revolving around the conceptualization of relatedness, its link to performance, and the appropriate measurement. The limitations of existing research are discussed with reference to these three questions. Eight potential avenues for future research are outlined building on the developments, strengths and deficiencies identified above. These avenues are by no means exhaustive but instead focus on the topics centrally important for pulling together the trove of scholarly efforts for a heightened understanding of this complex yet uniquely important construct of strategic management. Much like the underlying idea of synergy, this author holds that the total of scholarly efforts will be far greater than the sum of its individual parts when effort is directed towards combining and reconciling the various conceptual and methodological approaches that have evolved in recent years.

5.1 Which dimensions does relatedness pertain to?

As the discussion of the wide array of dimensions has demonstrated, the concept of relatedness is not easily captured. On the one hand, this difficulty is integral to the term, which lacks a precise definition and is easily imbued with different meanings. On the other hand, this variety impedes comparability between studies, as many of them employ different, often proprietary conceptualizations of relatedness in the absence of a universally applicable framework. Several avenues for future research derive from these conflicting demands.

5.1.1 Avenue 1

While recent scholarship has rightly acknowledged the complexity and multidimensionality of relatedness, it has not yet translated this awareness into a unifying, holistic relatedness framework. This review and the relatedness research framework it provides can serve as a starting point for this task, but more conceptual and empirical research is required to collate the different dimensions. Even more promising, however, appears the prospect of building on the recognition of multidimensionality but taking it to its opposite conclusion: Since every combination of businesses is unique in its synergies and dissynergies, no one conceptualization can be expected to serve as a one-size-fits-all solution, and a grand unifying scheme of relatedness seems unlikely to emerge. Thus, instead of attempting to create an all-encompassing framework, further scholarship could settle for the more humble goal of uncovering the relatedness–performance relationship in individual dimensions. This would likely yield a more nuanced answer about which dimensions fare best as predictors of success in different industries and at different stages of the industry life cycle.

5.1.2 Avenue 2

Second, as industry boundaries are blurring in the face of new technologies, the idea of looking at vertical industries to measure relatedness seems outdated. As early as 1956, Robinson (1956: 361) had already noted that 'a precise and meaningful definition of an industry is a vain objective.' This is all the more true in today's economy, where platform organizations often combine in ways not reflective of traditional industry classifications (Libert et al. 2016). Most research on related diversification, however, dates back to times where technology was not yet as pervasive. A potent avenue for advancing relatedness research thus comes in the form of new ways to capture business portfolios. One potential answer could lie in the notion of the business model, which has received increasing attention both in the literature and in practice and has been referred to as the logic of a business. Sohl and Vroom (2014, 2017), for example, take a first step in this direction and find that their construct of business model relatedness is more relevant in determining firm performance than conventional industry relatedness. They propose to classify business portfolios using their employed business models instead of industry affiliation. Accordingly, relatedness occurs when business models have similar alignments or belong to the same type. However, this marks only one potential way of disaggregating business portfolios; more research seems warranted.

5.1.3 Avenue 3

Finally, and critically, a promising avenue could delve into the management's diversification logic (i.e. the motivating force behind any diversification move). These logics indicate which dimension of relatedness the management plans to exploit. It is therefore the precursor of the dimensions through which two businesses will eventually achieve their synergistic benefits and thus of the relatedness conceptualization itself. As different reasons will occur in any empirical sample, research that is ignorant of the diversification logic will hardly capture the relevant dimensions for each individual firm. While synergies or scope economies are naturally often a key motivation, other reasons, either market-, resource-, or product-driven, exist. For example, the industry life cycle can dictate diversification if the industry is in structural decline. In this case, an industry that is unrelated at least in terms of its cyclicality will be preferred. Alternatively, many emerging technology firms diversify into new product offerings along their clients' customer journeys in an attempt to cover all of a customer's touchpoints during interactions with the company (Toedt 2015). These and other effects are not considered in current assessments of the diversification–performance linkage. Accordingly, this line of research could use information on the diversification logic to better dissect and segment data based on their motivations. A clean subset of diversification moves aimed at achieving synergy, rather than large, cross-sectional samples, would be much more likely to show a clear link and provide insights into the critical success factors for unlocking synergies.

5.2 How does relatedness enhance performance?

The ways in which resources combine to create value have received increasing scholarly traction, as evidenced by the growing body of research on the analytical distinction between similarity and complementarity and the introduction of a temporal dimension of sharing through redeployability. Nevertheless, since researchers have only recently begun to unpack the mechanisms of relatedness, this line of inquiry is still at a nascent stage. As a consequence, little empirical effort has been directed towards untangling the different mechanisms of relatedness and how they contribute to value creation.

5.2.1 Avenue 4

As a natural extension of current efforts, a formal treatment of complementarity as a discrete mechanism of relatedness offers plenty of opportunities for further research. While complementarity as an economic concept is not new, the reference clustering shows that its application to diversification in RBT is still scarce. Several open issues merit further investigation. First, the definition of the term needs to be formulated with care. While the idea that value is derived from combining dissimilar (as opposed to similar) resources appears intuitive, the question about in which cases dissimilar resources combine synergistically and in which cases they do not remains. Simply designating every beneficial dissimilar resource combination as complementary without qualifying under which conditions it creates value risks being tautological. Makri et al. (2010) provide a good starting point with their description of knowledge complementarity, but whether and how this analysis can be translated to other resources remains to be investigated. Finally, building on these foundations, complementarity needs to be operationalized and tested empirically to further validate its explanatory power for related diversification.

5.2.2 Avenue 5

While the emergence of complementary in the context of relatedness is relatively new, the notion of redeployability is fresh 'out of the box' as the key publications formalizing the concept have appeared only in the last four years (Lieberman et al. 2017; Sakhartov and Folta (2014, 2015). Accordingly, much more conceptual work is needed to provide the foundation for further empirical analysis in this area. Similar to the open issues around complementarity, its positioning with the relatedness construct and its empirical operationalization are two key pillars for future research.

5.2.3 Avenue 6

In addition to these promising pathways, the unpopular counterpart of value creation, the cost of relatedness, merits further scholarly treatment. Kumar (2013: 1827) notes that 'we have only a cursory understanding of the costs that arise in related diversified firms, and the literature is still at an inception stage in terms of uncovering these costs.' Hence, research in this line could specify the mechanisms by which

diseconomies may arise within related diversified as opposed to unrelated diversified firms and test whether the inclusion of costs provides a better understand of the diversification–performance relationship. Ahuja and Novelli (2017) take a promising first step in that direction by identifying nine 'anti-synergies' or costs of diversification, which can be tested for performance effects individually if appropriate measures for each cost are found.

5.3 How is relatedness appropriately measured?

It has been argued that 'few measurement procedures have been more heavily criticized than those used to capture relatedness' (Lien and Klein 2009: 1099). As this appraisal demonstrates, the measurement of relatedness remains one of the most hotly contested areas of research. At the same time, such measures have been employed for an increasing range of topics within the field of strategic management and beyond. Despite this harsh critique, a continued reliance on relatedness measures is therefore to be expected and calls for further research to improve the quality and validity of relatedness measurement. As pointed out at the outset, the methodical appraisal of all existing measurement approaches is worthy of a review in its own right and beyond the scope of this study. Accordingly, the following two avenues only pertain to issues emanating from the conceptual analysis conducted in this paper which directly affect the measurement strategy.

5.3.1 Avenue 7

The reference clustering and the conceptual analysis indicate a clear divide between market- and resource-based measures as the two most prominent approaches to measuring relatedness. This dichotomy is owed to early interest of IO economists in the subject of diversification (e.g., Gort 1962; Arnould 1969; Palepu 1985), which was later superseded by scholars of RBT. However, as the discussion of the dimensions has shown, businesses can be related on both these levels and reap according benefits. The current theoretical disconnect between the two views will prevent any measure discounting the opposite theoretical vantage point from capturing relatedness in its full scale. Accordingly, a unifying perspective that overcomes the current resource-market dichotomy is called for.

5.3.2 Avenue 8

As second problem impeding measurement progress is the lack of measures that are replicated and used for subsequent research. None of the measures that have been introduced in recent years have found widespread adoption in the literature (Weiss 2016). Instead, researchers even today often revert to the deficient entropy and concentric indices. This choice is comprehensible given how conveniently these measures can be constructed from readily available databases such as S&P CapitalIQ. As a result, any study hoping to overcome current deficiencies and translate today's more sophisticated understanding of relatedness into a new measure must consider

ease of construction and replication to increase its chances of adoption. Accordingly, scholars could aim to construct measures based on secondary data that is not reliant on the hierarchy of the SIC system. The work of Nocker et al. (2016) discussed above presents a commendable effort in this direction and hopefully spawns further research.

6 Conclusion

Relatedness has become one of the most critical constructs within RBT for understanding diversification and corporate strategy. Despite the sustained scholarly interest in the topic for over 40 years and across disciplinary boundaries, many open issues remain. This review has set out to identify, organize and discuss these issues along three guiding questions: Which resource dimensions does relatedness pertain to, how does relatedness enhance performance, and how is relatedness appropriately measured? In answering these questions, a holistic research framework has been put forth that places individual contributions into their wider context and identifies promising avenues for future research.

In 2011, Barney et al. looked back at two decades of resource-based inquiry since the 1991 publication of the *Journal of Management* special issue on the topic. They found that resource-based research had reached a level of precision and sophistication that confers upon it maturity as a theory and that it now lies at a critical juncture, which will be followed by either revitalization or decline. In this vein, this review aims to capture the construct of relatedness, one of the central queries in RBT, and advance its explanatory power and predictive potential. Despite its elusive nature, capturing relatedness will continue to be a critical task for scholars and practitioners alike for as long as diversification remains an 'unpredictable, high–stakes game' (Markides 1997: 93).

Appendix 1: Sample search protocol for ABI/Inform database

Search area	Peer-reviewed journals; english
Step 1	Relatedness or diversification and RBT in abstract or title
Search terms	((ab("relatedness") OR ti("relatedness")) OR (ab("related diversif*") OR ti("related diversif*")) OR (ab("related acquisition") OR ti("related acquisition"))) OR ((ab("resource-based") OR ti("resource-based")) AND (ab("diversification*") OR ti("diversification*")))
No. of articles found	1172
Step 2	All three keywords in full text

Search area	Peer-reviewed journals; english
Search terms	(((ab(“relatedness”) OR ti(“relatedness”)) OR (ab(“related diversif*”) OR ti(“related diversif*”)) OR (ab(“related acquisition”) OR ti(“related acquisition”))) OR ((ab(“resource-based”) OR ti(“resource-based”)) AND (ab(“diversification*”) OR ti(“diversification*”)))) AND (ft(“RBV” OR “RBT” OR “resource-based” OR “resource based” OR “Rumelt”) AND ft(“relatedness” OR “related diversif*” OR “related acquisition”) AND ft(“diversif*”))
No. of articles found	111
Step 3	Reference to value-creating mechanism
Search terms	((((ab(“relatedness”) OR ti(“relatedness”)) OR (ab(“related diversif*”) OR ti(“related diversif*”)) OR (ab(“related acquisition”) OR ti(“related acquisition”))) OR ((ab(“resource-based”) OR ti(“resource-based”)) AND (ab(“diversification*”) OR ti(“diversification*”)))) AND (ft(“RBV” OR “RBT” OR “resource-based” OR “resource based” OR “Rumelt”) AND ft(“relatedness” OR “related diversif*” OR “related acquisition”) AND ft(“diversif*”))) AND ft(“economies of scope” OR “synerg*” OR “complementar*” OR “redeploy*”)
No. of articles found	104

Appendix 2: Overview of journals, share and journal impact factor

Journal	No. of articles	Journal Impact Factor (JIF)	5-Year JIF	Cum. share (%)	Total share (%)
Strategic Management Journal	46	3.341	6.061	56.1	56.1
Academy of Management Journal	12	6.448	9.812	70.7	14.6
Organization Science	6	3.775	6.309	78.0	7.3
Academy of Management Review	4	7.475	10.736	82.9	4.9
Journal of Management	3	6.071	9.238	86.6	3.7
Journal of Management Studies	3	3.763	5.883	90.2	3.7
MIS Quarterly	2	5.311	8.490	92.7	2.4
Management Science	2	2.482	3.399	95.1	2.4
Academy of Management Annals	1	7.769	10.866	96.3	1.2
British Journal of Management	1	2.982	2.704	97.6	1.2
Journal of Intsernat. Business Studies	1	3.563	6.067	97.6	1.2
Journal of Finance	1	5.424	7.546	98.8	1.2

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