

Strategic Alliance Research in the Era of Digital Transformation: Perspectives on Future Research

He, Q., Meadows, M., Angwin, D., Gomes, E. & Child, J.

Published PDF deposited in Coventry University's Repository

Original citation:

He, Q, Meadows, M, Angwin, D, Gomes, E & Child, J 2020, 'Strategic Alliance Research in the Era of Digital Transformation: Perspectives on Future Research', *British Journal of Management*, vol. (In-press), pp. (In-press).

<https://dx.doi.org/10.1111/1467-8551.12406>

DOI 10.1111/1467-8551.12406

ISSN 1045-3172

ESSN 1467-8551

Publisher: Wiley

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

Copyright © and Moral Rights are retained by the author(s) and/ or other copyright owners. A copy can be downloaded for personal non-commercial research or study, without prior permission or charge. This item cannot be reproduced or quoted extensively from without first obtaining permission in writing from the copyright holder(s). The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the copyright holders.

Strategic Alliance Research in the Era of Digital Transformation: Perspectives on Future Research

Qile He , Maureen Meadows,¹ Duncan Angwin ,² Emanuel Gomes³
and John Child⁴

University of Derby, Kedleston Rd, Derby DE22 1GB, UK, ¹Coventry University, Priory Street, Coventry CV1 5FB, UK, ²Nottingham University Business School, Nottingham University, Jubilee Campus, Nottingham NG8 1BB, UK, ³Nova School of Business and Economics, Universidade Nova de Lisboa, Campus de Carcavelos, Rua da Holanda, n.1, Carcavelos 2775-405, Portugal, and ⁴University of Birmingham, University House, Birmingham B15 2TT, UK
Corresponding author email: q.he@derby.ac.uk

The emerging digital transformation in the twenty-first century is rapidly and significantly changing the business landscape. The fast-changing activities, expectations and new modes of collaboration suggest it is time to review the current theoretical insights from strategic alliance (SA) research, which are based on assumptions from a different era. We therefore aim to stimulate multidisciplinary debate and theoretical reflections to better understand emerging paradoxes and challenges that contemporary firms face in the formation, evolution and dissolution of strategic alliances. Specifically, we offer alternative visions of SA research and suggest fresh applications or supplements of existing theoretical perspectives and research methods that can better address the research questions emerging from an era of digital transformation.

Introduction

Over the past three decades, strategic alliances (SAs) have attracted substantial attention from industry and academia (e.g. Child *et al.*, 2019; Das, 2006; Devlin and Bleackley, 1988; James, 1985). While offering incremental improvements to our understanding of the phenomenon, most previous work has tended to follow a gap-filling approach based on traditional theoretical assumptions. In this paper we question whether the theoretical

underpinnings and accepted methodologies of such studies, largely based on assumptions from a different era, are still sufficient to permit adequate understanding and management of SAs in the twenty-first century. We therefore propose that fundamental and rapid changes in the wider environment mean it is timely to review the theoretical and practical insights of earlier SA studies. This paper will explore the opportunities, issues and paradoxes of managing SAs in the era of digital transformation, and aim to trigger future debates about, and investigations of, new applications, supplements and combinations of existing theories, as well as alternative theoretical perspectives and interpretations.

Currently, the strategic environment of businesses is changing faster than ever, due to rapid technological evolution, saturation of existing marketplaces and the emergence of new markets

Authors of this paper would like to thank the Co-Editor-in-Chief, Professor Geoffrey Wood, and anonymous reviewers for their excellent comments and guidance in revising this paper. Emanuel Gomes would like to acknowledge financial support from Fundação para a Ciência e Tecnologia (UID/ECO/00124/2013) by LISBOA-01-0145-FEDER007722 and Social Sciences Data Lab, Project 22209.

and business models, the growing salience of innovation, globalization of businesses on the one hand and de-globalization of the market on the other (Foroohar, 2018). The balance of the global economic and political structure is also changing, challenging the strategic vision of many businesses with regard to their cooperative strategies.

Among all these changes, the emerging digital transformation is creating massive contextual development. Digital transformation refers to ‘the profound and accelerating transformation of business activities, processes, competencies, and models to fully leverage the changes and opportunities brought by digital technologies and their impact across society in a strategic and prioritized way’ (Demirkan, Spohrer and Welsch, 2016, p. 14). During this transformation, the dominant purpose of SAs is shifting from skill/resource substitution and new market entry towards an emphasis on facilitating innovation and capitalizing on disruptive new technologies as a means to provide new types of products and services, including digitally integrated ones (Bustinza *et al.*, 2019). As a consequence, contemporary companies need to review their traditional business models for interfirm collaboration and relationship coordination to meet rapidly changing expectations, requirements and characteristics of existing or potential strategic partners (Bouncken and Fredrich, 2016).

A SA denotes a voluntary relationship between two or more independent organizations, normally firms, which is intended to achieve both their individual and mutual strategic objectives. The concept of a SA is a multi-dimensional one that depends on (i) the degree of integration between partners and (ii) the underpinnings of the relationship between partners (e.g. ownership, contract and trust). SA represents a broad array of strategic partnerships across interfirm (and increasingly intersector) boundaries, with many different alliance types or arrangements. Complex interfirm relationships have the potential to generate significant benefits for firms, but they can also induce various relational risks (e.g. Gallea, Ghobadian and He, 2015; Nooteboom, Berger and Noorid-erhaven, 1997), such as opportunistic behaviour (Das and Rahman, 2010), cultural clashes (Gomes, Cohen and Mellahi, 2013) and lack of commitment (Cullen, Johnson and Sakano, 2000). As a result, changes in the environment bring new challenges to firms that are currently in, or seeking to form, SAs. For instance, the emergence of new

business models in which value creation and appropriation are continuously redefined due to constant technological disruptions, requires a more co-evolutionary approach and agile management of SAs. Although previous studies have devoted extensive attention to understanding the importance of SAs in product innovation (Colombo and Rabbiosi, 2014; Paiola *et al.*, 2013), very little is known about the role of alliances in digitally integrated product–service innovation (e.g. truck tyre manufacturers partnering with technology firms to integrate fleet management chips into tyres). It is in the context of such environmental changes that new light needs to be shed on alternative alliance formations, structures and governance mechanisms, capable of dealing with such new issues and paradoxes for participants.

Overall, it is important to realize that the underlying assumptions behind SAs are changing rapidly. Although research is beginning to address this changing landscape and explore the implications of the new developments (e.g. Arranz, Arroyabe and Arroyabe, 2017; Balboni, Marchi and Vignola, 2017; Kohtamäki, Rabetino and Moller, 2018; Mindruta, Moeen and Agarwal, 2016), there is still a lot to be done. This is because previous work tends to follow either the established literature review or traditional gap-filling approaches, and makes little attempt to challenge existing theoretical underpinnings (Alvesson and Sandberg, 2011). Consequently, existing theoretical perspectives continue to be applied and extended, regardless of the bigger changes threatening the contextual assumptions of those theories. In other words, the new environment of SAs brings into question the boundary conditions of existing theories (Busse, Kach and Wagner, 2017). We argue that a forum for debate, extending and challenging existing perspectives, is urgently needed as there is a lack of synthesized work that takes into account the changing nature of SAs in a rapidly evolving environment. In developing this paper, we offer a critical perspective by reviewing the main applications of existing theories in some significant ways and offering a major opportunity for the development of interesting and influential theories in the future.

We take a problem-focused approach in arguing that there is a need to examine the challenges of researching and managing SAs when the external environment is highly dynamic and complex. We take our cue from the emerging digital

transformation that is reshaping business activities, models and expectations. We address the question of ‘what is new?’, first by reviewing the existing theoretical underpinnings of SAs and the main timelines of SA theoretical development and research methodology; second by summarizing the new changes brought about by digital transformation; and third by providing an overview of how digital transformation impacts upon SA research and identifying future routes for theory application, supplementation, combination or development. We develop a summary framework that seeks to build bridges between existing theories and broaden the scope of future thinking around SAs.

Review of theories and methodology of strategic alliance research

Past SA research has been built upon a wide array of theories and perspectives. Child *et al.* (2019), for example, suggests these theories can be grouped into three categories: (i) economic perspectives, such as transaction cost economics (TCE) (Williamson, 1981), the resource-based view of the firm (RBV) (Barney, 1991), the knowledge-based view of the firm (KBV) (Grant, 1996), the dynamic capabilities view (DCV) (Teece, Pisano and Shuen, 1997) and agency theory (Eisenhardt, 1989); (ii) managerial and organizational perspectives, such as game theory (Parkhe, 1993), resource dependence theory (RDT) (Hillman, Withers and Collins, 2009; Pfeffer and Salancik, 1978) and stakeholder theory (Freeman, 1984); and (iii) behavioural perspectives, such as social capital theory (SCT) (e.g. Koka and Prescott, 2002). Some of these theories are more frequently cited in the area of SAs, such as TCE, RBV, KBV, SCT and RDT, while others are under-used, such as game theory, DCV, agency theory and stakeholder theory. Table 1 shows the important theories adopted in SA research, their key assumptions, applications, mechanisms and outcomes for SA research.¹

Generally, these theories have provided important lenses through which SA researchers have investigated the SA phenomenon. For example,

TCE has enabled researchers to explain different governance structures of SA, including in contract-based relationships or equity joint ventures (e.g. Houston and Johnson, 2000; Parkhe, 1993). Game theory enables the study of factors that can influence levels of opportunistic behaviour between two or more partners (e.g. Bó, 2005; Ferrin, Bligh and Kohles, 2007; Parkhe, 1993; Song and Panayides, 2002). Informed by RBV (Barney, 2001; Peteraf, 1993), SA researchers highlight the potential mutual benefits gained from collaborative interfirm relationships, which allows the sharing of complementary resources from alliance partners, while maintaining independent status. Similarly, KBV (Grant, 1996) has inspired research verifying the value of alliance formation and governance for sharing intangible knowledge resources. RDT (Hillman, Withers and Collins, 2009; Pfeffer and Salancik, 1978) offers important explanations regarding the alternative governance structures of SAs. SCT (e.g. Koka and Prescott, 2002) suggests interfirm relationships represent social capital, and thus dimensions of social capital depend on the alliance structure as well as overall alliance experience and history. Although limited in number, SA studies drawing upon the DCV offer an enhanced understanding of an individual firm’s evolving capability in managing the lifecycles of SAs in fast-changing environments, as well as the capability of SAs to learn more quickly and better than individual firms on the basis of partner synergies along with changing circumstances (e.g. Schilke, 2014).

However, existing research into SAs is largely based on assumptions which were typically developed in previous decades. Tables 2a and 2b illustrate the timeline of major landmarks of theory development and adoption by SA research. The establishment of those theories, which are regarded as the mainstream of SA research, more or less reflected the currency of the economic, political, social and technological environments at the time. Most SA studies, whether conceptual or empirical, have applied these theories to the context or practical challenges prevailing at the time they were conducted.

These theories will continue to shed light on how we understand the phenomenon of SA. However, there are four major factors which potentially threaten the relevance of existing SA research and also point to the opportunity for further theoretical development. First, the classical theories of

¹A more complete review of theoretical perspectives of SA studies can be found in Appendix A of the online Supporting Information.

Table 1. Existing theoretical underpinnings of strategic alliance studies

Theoretical perspective	Some key assumptions	Some key references	Some key applications	Some key mechanisms	Some key outcomes for SA research
Transaction cost economics	Behavioural assumptions of bounded rationality, opportunism and risk neutrality	TCE: Chiles and McMackin (1996), Hill (1990), Simon (1961), Williamson (1981, 1985) Application of TCE to SA: Das and Teng (1998), Dyer (1997), Hennart (1988), Judge and Dooley (2006)	Alliance negotiation Managing risk and opportunistic behaviour Partners' status and similarity Influential factors on partners' opportunistic behaviour	Formal and relational governance mechanisms Negotiation and contractual issues, such as contract complexity, length, resource specificity, exclusivity, bargaining power, payments and costs Trust and control mechanisms Trust as a substitute for contracts	Mitigate the risk of opportunistic behaviour Protection of proprietary assets The impact of opportunism on performance The probability that actors will behave opportunistically increases as investments in specific assets by other parties increase TCE explains the boundaries between the alliance and the market, and different governance structures SAs as a mid-way governance structure between complete integration and spot market transactions
Resource-based view	Competitive advantage originates from the possession of inimitable resources Some resources and capabilities can only be developed over long periods of time Assumes bounded rationality and uncertainty	RBV: Barney (1991, 2001), Dierckx and Cool (1989), Penrose (1959), Peteraf (1993), Wernerfelt (1984) Application of RBV to SA: Das and Teng (2000), Street and Cameron (2007)	Alliance rationale Resource-seeking and complementarity Synergy and cost reduction Achievement of economies of scale and scope Investment and risk-sharing Inter-partner resource alignment	Strategic fit assessment Small business alliances and networks Resource similarity Resource access Resource sharing Resource utilization	Mutual benefits can potentially be gained from collaborative interfirm relationships, which allow the sharing of complementary resources between alliance partners while maintaining independent status; this may be due to causal ambiguity, social complexity, resource heterogeneity and imperfect mobility Collective strengths and interfirm conflicts in alliances are important factors to consider
Knowledge-based view	Intangible knowledge is an important resource, and potential source of competitive advantage Particular tacit knowledge or 'know-how' may help the firm to deploy its resources in a more productive way	KBV: Conner and Prahalad (1996), Grant (1996), Penrose (1959), Wernerfelt (1984) Application of KBV to SA: Grant and Baden-Fuller (1995, 2004), Kale, Singh and Perlmutter (2000), Kogut and Zander (1992)	Knowledge transfer Shared learning and experience Technology development Absorption capacity Access to new markets International entry strategies	International partner selection Learning and protection of proprietary assets Equity and contractual arrangements Key employee appointment and learning capabilities Knowledge acquisition Knowledge sharing Knowledge utilization	Imperfect congruence between a firm's product and knowledge domains (i.e. via an interfirm relationship, a firm can either access or integrate knowledge which can be more efficiently provided by other firms, or permit knowledge which is only partially deployed within the firm to be utilized more fully) More diversified knowledge resources are available in interfirm relationships than within the firm itself There is a need to verify the value of alliance formation and governance for sharing know-how and intangible knowledge resources Knowledge motivated alliances contribute to increased firm specialization

Table 1. Continued

Theoretical perspective	Some key assumptions	Some key references	Some key applications	Some key mechanisms	Some key outcomes for SA research
Resource dependence theory	Organizational survival hinges on the ability to procure critical resources from the external environment To reduce uncertainty in the flow of these resources, organizations can try to restructure their dependencies with a variety of tactics, including constraint absorption	RDT: Casciaro and Piskorski (2005), Hillman, Withers and Collins (2009), Pfeffer (1972), Pfeffer and Leong (1977), Pfeffer and Salancik (1978) Application of RDT to SA: Drees and Heugens (2013), He, Ghobadian and Gallea (2013)	Inter-organizational dependencies Management of external interdependencies Inter-organizational power Alliance instability	Management of conflict Bargaining power and instability Alliance formation and organizational autonomy and legitimacy Inter-organizational power balance Strategic resource control The use of boards of directors as mechanisms to gain resources and minimize inter-organizational dependence	Organizations can absorb constraints completely via M & A; partial constraint absorption can be achieved through formal long-term contracts, such as joint ventures Constraint absorption differs significantly from other responses to resource dependencies in that it is the only tactic that gives the dependent organization direct control over valued resources RDT thus offers potentially important explanations regarding the alternative governance structures of SAs Resource acquisition reduces environmental complexity, uncertainty and inter-organizational interdependence SAs are conduits of information. Possession of key information and control of information flow create entrepreneurial opportunities. A firm's set of alliances provides benefits or limitations in terms of information volume, information diversity and information richness Interactions between firms establish a pattern of obligations and expectations that are based on norms of reciprocity and equity Firms need to evaluate alliances in the context of their entire network of relationships
Social capital theory	Over time, organizations typically establish a variety of interfirm ties, enabling them to exchange a range of information, knowledge and other forms of capital Interfirm relationships represent social capital	SCT: Burt (1992, 1997) Application of SCT to SA: Das and Teng (2002), Koka and Prescott (2002), Tsai and Ghoshal (1998)	Cultural management Conflict management Communication management Alliance partner commitment	Strategic networks Management of relational risk and performance risk Social ties Communication management, coordination and commitment Contractual commitment Leadership and decision making Structural (social interaction), relational and cognitive mechanisms	Any factors that can destabilize a strategic relationship will negatively impact relational factors between strategic partners and consequently increase the chances of opportunistic behaviour The exploration of factors that can influence levels of opportunistic behaviour between parties, such as trust reciprocity and contractual safeguards
Game theory	Addresses the behaviour of two parties in a mixed-motive social dilemma, where cooperation may maximize joint interest but not necessarily maximize self-interest	GT: Bó (2005), Dawes (1980), Ferrin, Bligh and Kohles (2007), Song and Panayides (2002) Application of GT to SA: Child <i>et al.</i> (2019), Parkhe (1993), Parkhe, Rosenthal and Chandran (1993)	Voluntary interfirm collaboration Cooperation through simultaneous collaboration and competition Partner commitment	Alliance structures Binding arbitration Reciprocal agreements Incentives to defect: greed and fear Communication and control mechanisms	Any factors that can destabilize a strategic relationship will negatively impact relational factors between strategic partners and consequently increase the chances of opportunistic behaviour The exploration of factors that can influence levels of opportunistic behaviour between parties, such as trust reciprocity and contractual safeguards

Table 1. Continued

Theoretical perspective	Some key assumptions	Some key references	Some key applications	Some key mechanisms	Some key outcomes for SA research
Institutional theory	Rules, norms and values in the common setting exert pressures on firms to adopt similar isomorphic practices and structures, in order to gain social legitimacy and enhance survival prospects	IT: DiMaggio and Powell (1983), Meyer and Rowan (1977), Powell and DiMaggio (1991) Application of IT to SA: Dacin, Oliver and Roy (2007), Lin and Darnall (2015)	Governmental and economic policy on alliances SA and legitimacy	Alliance governance structure Partner networks and selection preferences Market, relational and social legitimization mechanisms	SAs are seen as legitimization mechanisms Institutional pressures motivate some firms to participate in SAs to improve social legitimacy and enhance their chances of survival Firms may form SAs to reduce regulatory pressures Firms operating within similar industries (and their professional associations) can exert normative pressures to collectively improve an aspect of their operations, thereby enhancing the industry's overall legitimacy
Dynamic capabilities view	Dynamic capabilities can be viewed as firm-specific and unique, or as exhibiting commonalities across firms ('best practices')	DCV: Barreto (2010), Eisenhardt and Martin (2000), Makadok (2001), Schilke (2014), Teece, Pisano and Shuen (1997) Application of DCV to SA: Anand, Oriani and Vassolo (2010), Fang and Zou (2009), Gulati (1999), Kale and Singh (2007)	SA as main means for innovation and new product development Alliances as substitutes for internal innovation Alliance rationale, choice of alliance type, and partner selection	Resource and competence reconfiguration to enhance strategic fit Complementary capability development	DCV offers SA researchers an important perspective on a firm's capability in – for example – managing the lifecycles of SAs, including forming, maintaining and dissolving SAs in fast-changing environments Alliance capability and entrance into new technology industries

Table 1. Continued

Theoretical perspective	Some key assumptions	Some key references	Some key applications	Some key mechanisms	Some key outcomes for SA research
Stakeholder theory	Addresses the principle of who or what really counts for an organization In the traditional view of a company, the key assumption is that only the owners or shareholders are important Stakeholder theory argues that there are other parties involved, including employees, customers, suppliers, etc.	ST: Donaldson and Preston (1995), Freeman (1984), Freeman, Wicks and Parmar (2004), Friedman and Miles (2002), Jensen (2002) Application of ST to SA: Bosse, Phillips and Harrison (2009), Wassmer (2010)	Alliance governance structures and network relationships Portfolio alliance management Ethical responsibility in networks	Alliance portfolio ownership and formation Portfolio alliance management Partner attributes in managing alliance portfolios Diversity in alliance portfolio Alliance formations based on networks External relations through networks Organizational culture and ethical values Social contracting	The alliance partner as another key stakeholder whose interests need to be considered; in situations such as SAs, stakeholders can see their interests as joint rather than opposed 'Enlightened value maximization' of the long-run value of the firm as the criterion for trade-offs amongst stakeholders, including external partners Stakeholder theory is valuable in exploring SAs beyond the private sector – including involving NGOs and public sector organizations
Contingency theory	There is no single 'best way' to organize or lead a firm, or to make a strategic decision	CT: Scott (1981) Application of CT to SA: Hoffmann (2007), Joshi (1995), Murray and Kotabe (2005)	Alliance governance structure fit with the environment Coalignment of alliance forms Uncertainty and alliance management and co-evolution	Appropriate match between alliance forms and attributes Choice between equity and non-equity alliances based on trust and formalization mechanisms Adapting, shaping and stabilizing, based on uncertainty and organizational resource endowment levels	The 'optimal' course of action (e.g. whether to enter into a SA or not) is contingent upon the internal and external situation Exploring the motivations driving firms to engage in SAs in different circumstances, and the factors that might be impacting upon the outcomes (successful or otherwise) of a SA

Table 1. Continued

Theoretical perspective	Some key assumptions	Some key references	Some key applications	Some key mechanisms	Some key outcomes for SA research
Agency theory	<p>Key <i>human</i> assumptions are self-interest, bounded rationality and risk aversion</p> <p>Key <i>organizational</i> assumptions are partial goal conflict, efficiency and information asymmetry</p> <p>The key <i>information</i> assumption is information as a purchasable commodity</p>	<p>AT:</p> <p>Eisenhardt (1989), Jemison (1987), March and Shapira (1987), Wright, Mukherji and Kroll (2001), Wright <i>et al.</i> (1996)</p> <p>Application of AT to SA: Child <i>et al.</i> (2019), Geringer and Hébert (1989), Gulati and Singh (1998), Lane, Cannella and Lubatkin (1998)</p>	<p>Alliance ownership structures</p> <p>Alliance governance</p> <p>Opportunism and information asymmetry</p> <p>The role of managers on alliance formation</p>	<p>Ownership choice, ownership strategy related to location and organizational advantage</p> <p>Equity ownership considering cultural distance and ethical values</p> <p>Patterns of ownership and control</p> <p>Hierarchical control mechanisms</p> <p>Post-alliance formation processes</p>	<p>Individuals in more complex, multilateral relationships may transmit negative sanctions to others because their self-interests are assumed to be competitively interrelated</p> <p>Agent and principal relationships can be extended to that of buyer to supplier, joint venture manager to partner owners, and cooperative relationships in which each partner becomes an agent for the other(s)</p> <p>The analysis/identification of governance and monitoring mechanisms which may be appropriate within a cooperative partnership</p>
Natural-resource-based view	<p>Three key strategic capabilities – pollution prevention, product stewardship and sustainable development – each have different environmental driving forces, build upon resources, and have a different source of competitive advantage</p>	<p>NRBV:</p> <p>Hart (1995), Hart and Dowell (2001)</p> <p>Application of NRBV to SA:</p> <p>Hart (2003), Mahoney, McGahan and Pitelis (2009)</p>	<p>Interdependence of private and public interests</p> <p>Resource access and usage in public/private partnerships</p> <p>Joint sustainable value creation</p> <p>Collective goods</p>	<p>Stakeholder integration</p> <p>Shared vision</p> <p>Boundaries and interconnectedness between private and public partners</p> <p>Interest alignment</p> <p>Interest aggregation</p>	<p>Possible motivations for entering into an alliance (e.g. the need or desire to work with a partner with strong environmental credentials, or a broad set of criteria for the 'success' of an alliance such as the environmental impact of a firm's activities)</p>

Table 2a. Timeline of popular SA theoretical underpinnings and adoptions

Transaction cost economics	
Theory adoption by SA research	<p>Hennart (1988) adopts a TCE perspective on joint ventures, using TCE to explain JV types and characteristics</p> <p>Dyer's (1997) seminal paper demonstrates that transaction costs do not necessarily rise as relation-specific investments increase</p> <p>Judge and Dooley (2006) find that partner trustworthiness and contractual safeguards are negatively related to opportunistic behaviour in SAs – and that opportunistic behaviour is negatively related to alliance performance</p>
Resource-based view	
	<p>Eisenhardt and Schoonhoven's (1996) study of SAs finds that the underlying logic of alliance formation is both strategic needs and social opportunities</p> <p>Das and Teng (2000) discuss how the resource profiles of partner firms can determine their structural preferences, across four major categories of alliances (equity joint ventures, minority equity alliances, bilateral contract-based alliances, unilateral contract-based alliances)</p> <p>Barney (2001) revisits resources and competitive advantage</p> <p>Hart and Dowell (2011) return to the NRBV to explore links between environmental and financial performance, highlighting issues of sustainable enterprise such as pollution prevention, product stewardship and clean technology</p>
Knowledge-based view	
	<p>Grant and Baden-Fuller (1995) identify circumstances in which collaboration between firms is efficient in utilizing and integrating specialized knowledge</p> <p>Inkpen and Dinur (1998) offer insights into the integration of international joint ventures into a firm's dynamic system of knowledge creation</p> <p>Grant and Baden-Fuller (2004) argue that the primary advantage of alliances is in accessing rather than acquiring knowledge; and that alliances improve the efficiency with which knowledge is both integrated into the production of complex goods and services and utilized</p>

Table 2a. Continued

	Pre-1970s	1970s	1980s	1990s	2000s	2010 onwards
Classical theory development	Coase (1937) first introduced TCE	RDT formalized in the 1970s (e.g. Pfeffer and Salancik, 1978)	Seminal papers on TCE by Williamson (1981) and on RBV by Wernerfelt (1984)	Barney (1991) and Peteraf (1993) explore resources and competitive advantage		
	Penrose (1959) develops ideas behind the RBV			Seminal papers on NRBV by Hart (1995), on KBV by Grant (1996) and Burt (1992, 1997) explores social capital and competition		
Social capital theory						
Koka and Prescott (2002) argue that social capital yields three distinct kinds of information benefits due to SAs: information volume, information diversity and information richness						
Knoke (2009) uses social capital concepts to explain the evolution of the SA network in the global information sector						
Resource dependence theory						
Casciaro and Piskorski (2005) argue that mutual dependence is a driver of M&A, and power imbalance is an obstacle to M&A formation						
Hillman, Withers and Collins (2009) support the notion that M&As occur between firms that depend on one another (to reduce dependence) and that the magnitude of the dependency predicts the likelihood of the M&A						

Note: The table does not intend to include all papers in the field but an illustration of key landmarks of theory development and adoption in SA.

Table 2b. Timeline of less popular SA theoretical underpinnings and adoptions

<p>Theory adoption by SA research</p>	<p>Game theory Parkhe (1993) explores the argument that some alliance structures are more likely than others to be associated with high opportunity to cheat, high behavioural uncertainty and poor stability, longevity and performance</p>	<p>Song and Panayides (2002) apply cooperative game theory to analyse cooperation among members of SAs Ferrin, Bligh and Kohles (2007) seek to provide precise definitions of trust, monitoring and cooperation, and hence a more comprehensive view of the relationships between the three constructs</p>
<p>Contingency theory Joshi (1995) seeks to identify the conditions under which three different relationship marketing mechanisms – long-term relationships, partnerships and SAs – are most efficient. Opportunism is assumed to vary across exchange relationships</p>	<p>Murray and Kotabe (2005) argue that the proper coalignment of alliance form with alliance attributes can positively influence alliance performance Hoffman (2007) studies the evolution of alliance portfolios; the pattern typically evolves from adapting to the exploiting (stabilizing), according to the state of strategic uncertainty and the firm's resource endowment</p>	<p>Jiang <i>et al.</i> (2016) conceptualize alliance adaptation as a bundle of governance-based change practices in ongoing alliances; they explore why partner firms undertake alliance adaptations and how they benefit from these ex-post governance adaptations</p>
<p>Agency theory Reuer and Miller (1997) explore the evolution of international joint ventures, and the attendant performance implications for parent firms of internalization deals (i.e. the acquisition of the JJV by one firm buying out its partners)</p>	<p>Reuer and Ragozzino (2006) investigate whether agency problems brought about by the separation of ownership and control stimulate the development of firms' JV portfolios. They find that agency hazards can bring about extensions of firms' non-equity alliance portfolios in both international and domestic settings</p>	<p>Schilke (2014) suggests that dynamic capabilities, such as an alliance management capability, can give the firm competitive advantage, but this effect is contingent on the level of dynamism in the firm's external environment</p>
<p>Dynamic capabilities view Gulati (1999) shows that by influencing the extent to which firms have access to information about potential partners, network resources are an important catalyst for new alliances</p>	<p>Kale and Singh (2007) show that an alliance learning process (involving articulation, codification, sharing and internalization of know-how) is positively related to a firm's overall alliance success Fang and Zou (2009) conceptualize marketing dynamic capabilities (MDCs), investigate their development in international joint ventures (IJVs) and explore their effect on IJVs' performance and competitive advantage</p>	<p>Schilke (2014) suggests that dynamic capabilities, such as an alliance management capability, can give the firm competitive advantage, but this effect is contingent on the level of dynamism in the firm's external environment</p>

Table 2b. Continued

	Pre 1970s	1970s	1980s	1990s	2000s	2010 onwards
Classical theory development	von Neumann and Morgenstern (1944) first introduced game theory	Seminal papers on institutional theory by Meyer and Rowan (1977) and contingency theory by Scott (1981)	Seminal papers on stakeholder theory by Freeman (1984), on agency theory by Eisenhardt (1989) and on institutional theory by DiMaggio and Powell (1983)	Key paper on stakeholder theory by Donaldson and Preston (1995); DCV by Teece, Pisano and Shuen (1997)	Seminal papers on DC by Eisenhardt and Martin (2000)	
	Classical game theory paper by Nash (1950) Woodward (1958) develops ideas behind contingency theory					
Institutional theory						
		Lawrence, Hardy and Phillips (2002) argue that collaboration can act as a source of change in institutional fields through the generation of 'proto-institutions': new practices, rules and technologies that transcend a particular collaborative relationship and may become new institutions if they diffuse sufficiently				Lin and Darnall (2015) propose that SAs are typically either competency or legitimacy oriented, and that four structural dimensions characterize both types of alliance: organization learning, partner diversity, governance structure and partner relations
Stakeholder theory						
		Jensen (2002) argues for 'enlightened value maximization' (i.e. maximization of the long-run value of the firm) as the criterion for making the requisite trade-offs among its stakeholders, and specifies long-term value maximization or value-seeking as the firm's objective				
		Friedman and Miles (2002) seek to highlight the range of organization/stakeholder relations that can occur, the extent to which such relations change over time and how/why such changes occur				
		Freeman, Wicks and Parmar (2004) argue that stakeholder theory pushes managers to be clear about the kinds of relationships they want and need to create with their stakeholders to deliver on their purpose				

Note: The table does not intend to include all papers in the field but an illustration of key landmarks of theory development and adoption in SA.

Table 3. Timeline of SA methodology development trends

	Research design			
Problem crystallization	Exploratory		Exploratory & Formalized	
			Formalized	
Time dimension	Cross-sectional			Longitudinal
				Longitudinal
Communication mode	Survey			Observational
				Observational
Variable Association	Descriptive		Causal	
			Causal	
Data collection methods	Archival and databases			Digitally collected datasets
	Surveys: Telephone, Mail, Internet. Interviews			Digitally collected datasets
Data analysis methods	Qualitative		Qualitative & Big data analytics	
			Quantitative	
	Pre 2000s	2000s	2010s	Future trends?

Source: Author analysis based on Gomes et. (2016)

SAs have typically been used in isolation to inform the conceptualization processes and research design. This is not only due to the requirement of conventional peer-review processes for parsimonious development of focused research design, but also to the lack of effective research instruments capable of joining different theories together. Second, some existing theories are attracting less attention than others. For example, a potentially useful theory that is under-used is Parkhe's (1993) application of game theory to SAs, as only a few studies have subsequently made use of it. Third, as shown in Tables 2a and 2b, there are major time lags between the initial introduction of some classical theories and the adoption of those theories in SA research. For example, the first seminal paper applying the RBV in SAs was in 1996 (Eisenhardt and Schoonhoven, 1996), nearly 40 years after the first introduction of the concept (Penrose, 1959). The further back in the past that fundamental theoretical assumptions are developed, the more likely that changes in the world will reduce their insights to understanding contemporary SAs. Fourth, the adoption of SA theories has largely been shaped

by some key seminal works, which have remained in the mainstream conceptualization of SAs for a very long time. For example, the first adoption of TCE in SA scholarship was in the late 1980s to mid-1990s (Dyer, 1997; Hennart, 1988), with later researchers largely following its theoretical reasoning without much fundamental amendment.

Moreover, past SA research designs were largely shaped within the boundaries of these theoretical lenses, with their principles evolving only slowly. In their review of the SA literature, Gomes, Barnes and Mahmood (2016) identify how research designs have evolved over time. Their longitudinal review shows that while more exploratory studies with a looser structure were developed during the period prior to the twenty-first century, as the SA literature evolved over time, studies tended to follow, more and more, a problem crystallization design, with hypotheses increasingly based on existing literature (see Table 3 for a timeline of research design). This led to an increasing number of statistical studies, mostly cross-sectional, and only recently has the number of longitudinal studies analysing causality started to increase.

Interestingly, although the popularity of research on pure theory development has decreased progressively over the last two decades (see also Tables 2a and 2b), more conceptual and theoretical development work is also required with the aim of advancing the existing knowledge of SAs to suit the new era and enhancing our understanding of ongoing paradigm shifts (see Rabetino *et al.*, 2018).

As demonstrated by Sirmon, Hitt and Ireland (2007), even established and valuable theoretical underpinnings must be kept under review in dynamic environments. Therefore, we argue that new theories, supplementing existing theories, or new applications of existing theories, may offer better explanations of contemporary SAs. In the following section, we offer three examples – open innovation, blockchain and Industry 4.0 – to evidence how new changes are triggered by digital transformation, which in turn require further evolution in SA research.

Digital transformation and the new changes

Over the last three decades, the world's technologies – especially in the area of information and communication technology (ICT) – have been advancing at an exponential rate. This unprecedented advance is generally regarded as digital transformation, in which the capacity of data processing and storage has expanded dramatically. This has allowed more and more sophisticated digital applications to be possible, such as cloud-based applications, Internet of Things (IoT), 3D printing, big data analytics, machine learning, blockchain, digital product service integration (also known as servitization) and other related emerging Industry 4.0 aspects. The rapid diffusion of digital transformation is leading to new changes that frequently involve transformations of key business operations and processes. These changes also affect products, organizational structures and management concepts (Matt, Hess and Benlian, 2015), and even extend beyond firms' borders, for example by impacting sales channels and supply chains (as Matt, Hess and Benlian, 2015 note). Below we use three examples driven by digital transformation to illustrate the *different* changes that firms are experiencing, which call for revisiting the theoretical perspectives

of SA research. These examples are open innovation, blockchain and Industry 4.0.

Open innovation

Open innovation is a paradigm which assumes that firms can and should use external ideas as well as internal ideas (Chesbrough, 2003). Driven by digital transformation, this is a new paradigm where innovation is no longer a linear process but one where the user is feeding back to the producer regarding what innovation is needed (Bogers, Chesbrough and Moedas, 2018). This more exploratory innovation process does not necessarily take place prior to product launch, but rather during the service delivery period, a form of co-evolution, in which providers (manufacturers and knowledge-intensive business service (KIBS)) and clients engage in close co-creation, facilitated by ICT platforms.

As evidenced by the ongoing literature, open innovation has the following characteristics. First, a flip-over of the locus for innovation, such as customer co-creation (Lucas Jr *et al.*, 2013) and the DIY laboratory (Hecker *et al.*, 2018), is fast emerging. The future core of open innovation is the ability to create an ecosystem where alliances of people, organizations and sectors can foster co-creation (Bogers, Chesbrough and Moedas, 2018). Second, open innovation will require the adoption of a so-called 'open strategy' (Chesbrough and Appleyard, 2007) to promote openness beyond immediate firm boundaries and the use of partnerships to establish wider relationships, even between competitors. This is in sharp contrast to traditional business strategy, which has guided firms to construct barriers to competition (Chesbrough and Appleyard, 2007). Third, the boundaries between a company and its ecosystem will become less visible in order to allow innovations to be easily transferred inward and outward through ICT technologies (Zimmermann and Pucihar, 2015).

Overall, open innovation in a digitalized world involves both a bottom-up approach and co-creation for innovation. Under this paradigm, co-opetitive relationships will be increasingly highlighted as the source of innovation. As Bogers, Chesbrough and Moedas (2018) argue, open innovations can quickly create markets that do not fit neatly into existing sectors, as new entrants with new business models rapidly create entirely new markets.

Blockchain

Blockchain is used to establish integration over the Internet and can be understood as a many-to-many decentralized integration model, deployed in the public cloud to conduct secured transactions rapidly and at low cost. Blockchain maintains a public, open and distributed ledger of transactions without transaction party identities. It uses the public key infrastructure (PKI) to notify counterparties about executable transactions (the concept of the smart contract) (Korpela, Hallikas and Dahlberg, 2017). Blockchain thus minimizes unnecessary use of third-party intermediaries (i.e. transaction centres). Blockchain is capable of providing security and flexibility at lower cost than traditional transactions. Although blockchain needs further development, for example to meet the need for standardization of documents internationally to ensure fully automated transfer of documents between organizations (Korpela, Hallikas and Dahlberg, 2017), it is regarded as a promising future means of business-to-business transactions. Under this scheme, many-to-many business transactions will be possible, such that short-term and even ad hoc interfirm partnerships will be feasible.

Industry 4.0

Industry 4.0 is an emerging technology framework based on cyber-physical systems, coordinated by wireless and Internet-based protocols and standards. Industry 4.0 is enabled by some foundational technology advances, such as adaptive robotics, artificial intelligence (AI), big data analytics, embedded systems, IoT, Industrial Internet, cloud systems, additive manufacturing, simulation and virtualization technologies (Xu, Xu and Li, 2018).

Driven by digital transformation, Industry 4.0 is likely to reshape the manufacturing process, competition rules and structure of industries (Dalenogare *et al.*, 2018); it will also fundamentally change the mechanisms of interfirm relationships. Industry 4.0 will feature horizontal integration via value chains, vertical integration and networking of manufacturing or service systems, and end-to-end engineering of the overall value chain (Ustundag and Cevikcan, 2018). These new industrial structures require seamless connections across functions (internal or external)

and different companies (partners or competitors) in the value chain, with unnecessary middle parties fast disappearing. Thus, the supply chain network of future firms is likely to be much shorter, and supply chain partnerships can be extremely short-term and dynamic. Similarly, the much wider use of automation and robotics has lessened the need for physical labour, thus companies will increasingly move their focus towards customer-end services, in order to gain competitive advantage through new models of mass customization and servitization (Gomes *et al.*, 2019; Porter and Heppelmann, 2014). In the field of urban management, cities are seeking to become smart in dealing with challenges such as air pollution, traffic congestion, cyber security and fresh food supply. This has encouraged alliances of firms possessing specialized technical knowledge with public authorities.

Overall, the above examples of digital transformation suggest that the existing business models of companies will be increasingly data-driven, and new business models will rapidly emerge to redefine how companies create and deliver value. In addition, digital transformation opens new networking possibilities and enables cooperation between different actors (Schallmo *et al.*, 2017; Vendrell-Herrero *et al.*, 2018). These actors may well be business partners, customers, stakeholders and even competitors. In this context, the competitive boundaries between firms will be blurred and dynamic, in contrast to previous eras. Hence, modes of interfirm collaboration will be much changed.

Changing modes of collaboration for strategic alliance

New modes of interfirm collaboration for SAs will emerge, driven by new business models moving towards digitalization and decentralization of information processing (Cong, 2018). We argue that the way SAs are formed and operated between partners will also be very different, as described below.

First, traditional SA management aims to maintain a partner relationship for maximized benefit and the lifespan of the alliance may be many years from formation to maturation. Future firms, however, will rely increasingly on ambidexterity to manage SAs as rapid advances in technology make traditional models of SA obsolete. New opportunities brought about by fast technology improvement will mean that firms have to update

their capabilities in managing alliances in the new environment (Kohtamäki, Rabetino and Moller, 2018). More flexible, agile and even ad hoc virtual collaborations with much shorter lifecycles will emerge, enabled by advanced ICT solutions, such as virtualization, cloud computing and blockchain smart contracts (Cong, 2018; Kohtamäki, Rabetino and Moller, 2018; Tafti, Mithas and Krishnan, 2013). In contrast, the emergence of open innovation and servitization models also requires firms to be able to manage longer-term concentric alliances between manufacturers, KIBS and clients, as is characterized in combined product–service contracts (Gomes *et al.*, 2019; Porter and Heppelmann, 2014). Therefore, managing the ambidextrous tension between the need to quickly adapt a relationship and maintain long-term collaborative arrangements will require more co-evolutionary alliance management capabilities. Existing SA theories, however, are limited in their ability to address such ambidextrous strategies of SA management.

Second, changing customer expectations of firms in terms of sustainability and social responsibility, while providing products and services at lower cost, greater speed and with better customization, mean that firms need to collaborate more widely to secure better profit margins. For example, cooperation between competitors will be needed in certain open innovation contexts (Bogers, Chesbrough and Moedas, 2018). Moreover, the emergence of hybrid social ventures (Lee and Jay, 2015) between incumbents and new entrants has the benefit of providing new entrants with the necessary scale efficiency through access to network effects that result in the development of sustainability-oriented business ecosystems. For large incumbent firms, co-competition with the new entrants enables them to learn difficult to imitate sustainability behaviours and redefine relationships with sustainability-oriented employees and customers. Developments in new technologies, from cloud computing to blockchain, are making such co-competitive and hybrid collaborations possible. In the future, it is likely that more and more horizontal collaborations, such as warehouse sharing, fleet sharing and even human resource sharing, will be common practice among competitors. In this vein, co-competitive relationships will become increasingly important, with greater interplay between firms' strategies of cooperation and competition in the future (Arslan, 2018; Panico, 2017).

Third, future companies will be more likely to find that alliance partners turn out to be competitors under different platforms or transactions. This is the case primarily because the borders between industries are becoming more blurred. As industries converge, firms are forced to continuously redefine and reposition themselves in the value creation system. As a result, partners that previously had a complementary role end up becoming direct competitors. Future alliance partners will seek higher levels of information integration and technology collaboration as they compete for speedy entry into new markets and the capture of new opportunities from advanced technology solutions. Therefore, future SA management will increasingly focus on identifying suitable partners, building their capabilities quickly and switching to those partners as soon as it is beneficial to do so (Al-Laham, Amburgey and Bates, 2008). Hence, the traditional governance structure of SAs will also need to be updated (Jiang *et al.*, 2017).

Fourth, digital transformation will make dynamic and ad hoc collaboration possible (Kohtamäki, Rabetino and Moller, 2018). On the one hand, an emerging technology such as blockchain is seen to support the development of trust-based relations between the participants in SAs because of its accurate and indisputable record of transactions, contributions and benefits. On the other hand, firms will also need to initiate culture switches in terms of trust building, privacy and data sharing when the alliance partners become far more dynamic and numerous than before (Cong, 2018). The sharing of information, knowledge and other tangible or intangible resources with supply chain partners, alliance partners and even with competitors will be the source of future competitive advantage. Thus, the need for cyber security and protection of key resources (in this case, data, information and intellectual property (IP)) will be ever more important (Jiang *et al.*, 2016). But such requirements will be reflected increasingly in new dynamic collaboration mechanisms and also the governance of SAs, especially when IP protection is not consistently implemented across the world.

Fifth, given unprecedented advances in technology, it is unlikely that any one company can master all new technologies and capabilities at the same time; indeed, it may not be economically viable for any single company to do so. This may further the level of industrial specialty and division of labour. Future firms will gain competitive

advantage from their business ecosystem consisting of various actors and stakeholders. As such, SAs will serve as important interlinkages of this ecosystem, albeit in a different format than before. For example, more cross-sector alliances will emerge. Thus, there are an increasing number of alliances between auto manufacturers and AI firms, between oil exploration companies and high-tech companies, between medical device specialists and the medical profession, and between private firms and public agencies/non-governmental organizations (NGOs). Rather than considering alliances in a unitary sense, future SA managers' attentions will be on SA as part of business ecosystems in terms of their scope, boundaries and evolution. Just as Christopher (1998) once advocated that the supply chains will be the unit of competition, which was largely the case in the past two decades or so, it is most likely that future competition will be between ecosystems of companies.

Implications for future strategic alliance research

The implications of these emerging trends (discussed above) are highly significant for SA researchers. New modes of collaboration and models of SAs are emerging quickly. Motivations, incentives and mechanisms of SA collaboration will be very different from those of previous decades. We highlight the need for theoretical development to catch up with fast-emerging digital transformation and argue that for SA research to continue to advance, researchers need to both reflect on existing perspectives and pay greater attention to the different changes driven by a fast-evolving technology context. Traditional theoretical perspectives of SA will still be of value going forward, but new theoretical perspectives and new conventions for applying and combining existing perspectives (very likely to be multidisciplinary) will need to be developed to better explain the emerging phenomenon. We discuss the implication of these changes for future SA research under four headings: boundaries of SAs, how to manage SAs, the management of SA performance and research methods.

Boundaries of strategic alliances

Existing theories, such as TCE, provide explanations relating to the location of the boundaries

of firms and the formation of SAs. However, future SAs are likely to be more dynamic and exhibit non-linear trends due to radical technological changes (Kohtamäki, Rabetino and Moller, 2018; Todeva and Knoke, 2005), with the competitive edge of firms, as well as boundaries of SAs, being more ad hoc and blurred than ever before (e.g. linked to wider adoption of open innovation and cooperative relationships). TCE, for example, does not take account of the strategic value of alliances, such as in fostering innovation, which has become a key competitive factor. Alternative explanations are needed to explain and explore emerging dynamic and flexible SA relationships, cooperative relationships, SAs within interfirm networks and SA ecosystems. These alternative perspective explanations need to consider new driving forces behind dynamic relationships, and the cost–benefit balance between switching to new alliances and alliance clusters driven by new opportunities and the maintenance of relationships (Kohtamäki, Rabetino and Moller, 2018). In this vein, game theory (Parkhe, 1993) and the DCV (Teece, Pisano and Shuen, 1997), or the combination of the two, may bring important explanations to future understanding of the dynamic process of alliances and the relational equilibrium. Similarly, the expansion of network-based cooperation is rendering agency relationships more complex and presents a greater challenge to alliance governance. This calls for an extended review of agency theory. Moreover, the relevance and contribution of institutional theory has also grown as (i) politics is superseding economics as a driving force in the new global order and (ii) an increasing number of alliances are located in, or involve firms from, emerging and former transition economies.

The increasingly important role of the business ecosystem and the role of SAs in this ecosystem need to be supported by more explicit theoretical perspectives. Traditionally, the RBV (Barney, 1991) has offered important explanations for the source of competitive advantage of firms and the key driving force behind SA formation, that is resource accession. The relevance of the RBV has become partly superseded by the DCV in an age of technological and market disruption. Lavie (2006) suggests that while proponents of the RBV may have been correct when arguing that valuable resources are non-tradable and imperfectly mobile, they have failed to acknowledge the direct sharing of resources and the indirect transferability

of benefits associated with these resources. The compositional strategy pursued by some emerging economy firms in the earlier stages of their growth questions the assumption of resource non-transferability via alliances implicit in the RBV (see Luo and Child, 2015). Nowadays, the transfer of information and knowledge is becoming highly dynamic and open, enabled by new business models and seamless technology solutions (Ertz, Durif and Arcand, 2018; Hamari, Sjöklint and Ukkonen, 2016), and consequently *imperfect mobility* as the key assumption of RBV will be further challenged.

Given that future SAs are likely to place more emphasis on the importance of technology sharing and access to knowledge resources, the KBV (Grant, 1996) will play an even bigger role in explaining the boundaries of firms and the incentives for SA formation. Nevertheless, since the flow of knowledge and technology will be much faster and open, as enabled by digital transformation (e.g. driven by open innovation and Industry 4.0) and more dynamic alliance models, the nature of knowledge possession which traditionally gives firms a competitive advantage is likely to change. Researchers need to be aware that such knowledge will no longer be limited to the static explicit or tacit knowledge possessed by firms, but will also be in the form of dynamic capabilities to combine heterogeneous sources of knowledge and to mobilize such knowledge to commercial ends. In this sense, the DCV will be an important supplement to the KBV in explaining such capabilities. Moreover, the KBV also needs to be complemented by a political perspective taking account of how alliances can be used as a mechanism for the misappropriation of proprietary knowledge (Kale, Singh and Perlmutter, 2000). The KBV can also help to account for the increasing number of cross-sector alliances as the application of new technologies crosses traditional industry boundaries.

How to manage strategic alliances

Currently, substantive theories in SA are largely limited to supporting the management of bilateral linear interfirm relationships. Digital transformation will reshape the way companies collaborate with partners, either vertically, horizontally or concentrically, as well as how alliances operate and are managed (Kohtamäki, Rabetino and Moller, 2018). Nevertheless, how to manage such

extended, open, multilateral and non-linear relationships is rarely covered by existing theory. The emerging Industry 4.0 and application of blockchain are not just new technological configurations; they also require changes in behaviour and routines. How to maintain the right level of trusted transparency among many SAs in an ecosystem, to ensure a win-win situation, will be a key challenge facing SA managers. Alternative theoretical explanations are needed to guide the management of emerging SA models in future ecosystems. However, despite some recent attempts to understand this phenomenon (Bustinza *et al.*, 2019; Vendrell-Herrero *et al.*, 2018), explanations are still largely missing from the existing literature.

As mentioned earlier, the DCV (Tece, Pisano and Shuen, 1997) will have important implications for the interaction between firms and the dynamic business environment. It has the potential to help firms understand how to survive and gain transient competitive advantage in a fast-changing business environment. However, the application of the DCV needs to be extended further to enhance our understanding of how a firm can configure or reconfigure its portfolio of alliance partners in an agile and flexible manner, in an environment where the lifecycle of SAs will be much shorter.

Traditionally, the RDT (Casciaro and Piskorski, 2005) explains the balancing and leveraging of resources between alliance partners, in order to achieve an appropriate governance structure for an SA. However, with the emergence of more flexible and potentially ad hoc and virtual alliances (e.g. driven by open innovation and blockchain), an extension of the RDT and even new perspectives are needed to reflect the fact that future alliances are less bounded and will be more dynamic and contract-less. Resource dependence will be evened out by the vast availability of alternative resources enabled by more capable ICT and open systems. Any new development of the RDT or new perspectives needs to explain the alternative governance structure of future SAs. For example, the scope of the RDT needs to be extended to take account of the political and social legitimacy that alliances (especially international ones) require as a key resource for their survival and evolution, and which renders them to varying degrees dependent on institutional approval.

In the same vein, contingency theory (Pennings, 1975; Scott, 1981) may offer a micro view of SA decision-making and the optimum SA structure

in this dynamic environment. Contingency theory (e.g. Hoffmann, 2007; Joshi, 1995) is based on the assumption that there is no single ‘best way’ to organize or lead a firm, or to make a strategic decision such as whether to enter into an alliance. Instead, contingency theory claims that the ‘optimal’ course of action is contingent (dependent) upon the internal and external situation. Hence, the choice of alliance structure and the optimum portfolios of alliances for a focal firm will be a balance of different internal and external factors. Such a balance will reflect the trade-off between resource sharing enabled by more flexible and dynamic partnerships and the risk of obsolescence due to potentially ad hoc and virtual relationships, as well as the trade-off between the sharing of technological resources and the preservation of their special proprietary value. Contingency theory, by identifying relevant contextual conditions, will always retain its relevance, albeit that key contingencies change over time (e.g. multi-firm dynamic alliances result in a great increase in the complexity of contingencies due to multiple contexts). However, more research on alliance co-evolution may also be needed to better reflect the changing nature of SAs and to link to the explanations offered by contingency theory (Mollona, Neumann and Zollo, 2018).

The emergence of ad hoc, virtual and much extended SAs enabled by ICT solutions will also mean that the traditional use of SCT (Koka and Prescott, 2002) must be reviewed and extended to better explain such new relationship formats. On the one hand, the establishment or maintenance of future SAs may principally take place online (Kohtamäki, Rabetino and Moller, 2018). Therefore, computer and automated processes will become as important as, and in some instances more important than, the human agent during the alliance lifecycle. With the wider application of AI technologies, it is likely that more interfirm relationship ties will be managed with reduced levels of human interaction. SA research needs to address questions such as, what will be the social capitals in such new circumstances? And how can such social capitals be gained and managed? On the other hand, SCT needs to take account not only of interfirm relationships but also those (i) between alliances and institutions and (ii) between the agencies (especially governmental) that may be backing alliance partners. This is particularly

relevant to emerging economies, whose inter-governmental agreements (e.g. between China and African countries) can facilitate alliances between enterprises from their respective countries.

Moreover, the importance of relationship management for future SA management is not just in managing the operations of the relationship per se, but also in ensuring a ‘cultural fit’ for the success of SAs (Child *et al.*, 2019). The challenge of achieving cultural fit will be present in both external and internal settings. Externally, the growing number of alliances between qualitatively different partners, as found in international alliances, cross-sector alliances and public–private sector alliances, requires a better understanding of interfirm culture building. More discussion of cultural alignment, mutual understanding of culture and shared meaning from perspectives of organizational culture (e.g. Bronder and Pritzl, 1992; Brown, 1995; Lorange and Roos, 1992; Martin, 2002) could benefit future SA research. Such perspectives also need to better reflect on increasingly blurred alliance boundaries and shorter-term relationships. Internally, firms need to manage cultures to suit the much more dynamic interactions that take place between firms and their environment driven by digital transformation (Vial, 2019). Again, organizational culture studies should provide guidance, especially for the managers of SAs whose aims need to be adjusted to adapt to such changing interactions between firms and their environment.

There is also increasing pressure for corporations to demonstrate social responsibility and a commitment to a broad range of stakeholder interests at a time when public trust in corporate leadership is at a historic low (Edelman, 2020), and when there are mounting concerns about who controls the use of new technologies such as AI. This pressure speaks for a realignment of theorizing on alliance formation, away from an exclusive focus on economic motives and towards an appreciation of the benefits that collaboration with public and social organizations can bring for corporate legitimacy. For example, one avenue for enhancing legitimacy is to contribute digital expertise and resources to socially beneficial projects in cooperation with public authorities and NGOs.

Multi-stakeholder involvement in the business ecosystem suggests the need for future SAs to

adopt a renewed strategy of stakeholder management. For example, under the scheme of open innovation, various stakeholders may be the source of new ideas and innovations. In this sense, classical stakeholder theory (Freeman, 1984) needs to reflect the changing role of stakeholders in open innovation and firms' ecosystems. Stakeholder theory attempts to address the principle of who or what really counts for an organization. In contrast to the shareholder perspective, stakeholder theory argues that there are other parties that matter to the business, including employees, customers, suppliers, financiers, communities, governmental bodies, political groups, trade associations and trade unions (Freeman, 1984). When a firm is working with other key players such as an alliance partner and external stakeholders, the importance of this theory for SA researchers is clear. However, future extensions of stakeholder theory need to consider the more diverse role of various stakeholders and the changing locus of competitive advantage from the firm and its supply chain to its ecosystem, which involves a much wider and shifting spectrum of actors and stakeholders.

Managing the performance of strategic alliances

Different models of SAs are being driven by digital transformation. While in more traditional physical product settings SAs have tended to involve more fixed capital investments and were aimed at the achievement of synergies and economies of scale, SA success in high-technology settings depends more on understanding and managing customer needs and behaviours, through continuous engagement and service feedback analytics. As such, future SA performance will need to be monitored by a more comprehensive and different set of factors than has traditionally been adopted.

First, SA performance has traditionally been measured by the stability of the alliance and immediate business performance based on relatively linear functions; this may be replaced by a more dynamic, non-linear matrix of measurements (Mollona, Neumann and Zollo, 2018). This is because companies will experience more dynamic relationships with alliance partners, they will face a range of more demanding expectations and they will operate in a faster-changing environment. The goals of a SA manager in the future will be the

speedy identification of suitable partners given various expectations and constraints, and the management of more flexible and easily dismissible SA (e.g. driven by open innovation and blockchain technology). In this sense, the future performance of SAs will be measured more by agility and adaptation to the changing environment and expectations (Kohtamäki, Rabetino and Moller, 2018). For example, companies will differentiate their SA performance by their capabilities in dynamically identifying suitable partners and maximize gains from much shorter SAs. In this vein, the DCV continues to draw attention to the challenges of managing and renegotiating alliances in an era of disruption and turbulence. However, it would benefit from acknowledging how alliances can contribute to a compositional strategy (Luo and Child, 2015) which involves achieving competitive outcomes from the skilful and dynamic combination of resources that are not rare or unique. Likewise, contingency theory can also help SA researchers to identify differentiated SA performance by considering a wider array of heterogeneous external and internal factors.

Second, various stakeholders and actors will be an important part of firms' business ecosystems. Future businesses will increasingly build those stakeholders and actors into their new business models and their collaborative strategies. Rather than evaluating SA performance on the basis of a narrow set of economic or financial indicators, the performance of future SAs will be measured against a much wider set of performance indices, which reflects a diverse range of stakeholder and societal expectations. Hence, firms will need to integrate the broader agendas of those stakeholders into their SA measurement models, for example reflecting concerns that are environmental and social in nature (Canzaniello, Hartmann and Fifka, 2017; Kumar, Jain and Kumar, 2014; Lechler, Canzaniello and Hartmann, 2018). Again, stakeholder theory has the potential to play an important part in exploring the new landscape of SAs. Similarly, the natural-resource-based view (NRBV) is growing in relevance, as existential challenges to the natural environment have become widely recognized.

Overall, as firms' portfolios of SAs become increasingly dynamic, the performance goals of future SAs will also need to be dynamic rather than static. The performance measurement of SA requires reconfiguration, as firms reconfigure their

SA portfolios in a more speedy manner. This means that a variety of performance goals and targets should be under consideration, as new SAs are formed for different reasons. The management of SAs has been challenging in the past, but it may become more feasible in the future, enabled by increasingly sophisticated technological solutions.

Methods for researching strategic alliances

In line with the new theoretical development, future scholarly work on SAs will need to consider new factors that pose challenges to some traditional methodological approaches, while simultaneously presenting exciting opportunities for the study of SAs (see also Table 3 for future trends in research methodology).

First, new research on SAs in this era of digital transformation will involve searching for answers to new research questions (e.g. Kohtamäki, Rabetino and Moller, 2018). Therefore, as already happened in the early stages of development of the SA literature (see also Gomes, Barnes and Mahmood, 2016), the development of new exploratory and conceptual work as a way of enhancing our understanding of ongoing paradigm shifts will permit the construction of new concepts and models. It is in this context that scholars will need to engage more closely with practitioners in a dialectic process encompassing formulation, research design, theory development and practical problem-solving.

Second, the digital transformation of businesses is underpinned by, and simultaneously results in, unprecedented levels of data storage. Although more traditional methods of data collection (such as surveys, interviews and archival work) will continue to be used, researchers will need to resort to non-traditional data stored by firms in their day-to-day routine activities. As markets, products and processes become more and more digitalized, vast amounts of real-time data are stored on a continuous basis. Hence, the main difficulty faced by researchers will be developing collaborative industry–academia linkages to be able to access huge amounts of sensitive data. More embedded research designs should be possible, as firms may become more willing to host – or at least interact with – researchers who are prepared to contribute not only to the development of theory, but also to the generation of

practical solutions to ongoing and future issues. In this respect, the practical implications of research work may become as important as the theoretical implications. Action research is therefore likely to play an important role. Nevertheless, given the sensitivity of using real-time data, researchers will need to be able to nurture close long-term relationships with firms, and address novel ethical considerations. This is because using current real-time data about unfolding events can jeopardize companies' endeavours if confidentiality and anonymity are compromised by pressures to publish at an ever faster rate.

Third, instead of relying heavily on cross-sectional analyses, with the availability of rich longitudinal data, future research will be able to investigate more causalities and identify configurational combinatory explanations of complex ongoing events. For this purpose, more sophisticated quantitative data mining, and in some cases big data analytics, will be required. However, qualitative longitudinal processes, as well as observational approaches, will still be required to study numerous non-linear systemic factors that occur over time, at various levels and involving multiple stakeholders. A co-evolutionary perspective on SA development, in conjunction with the changing environment, will become more appropriate.

Framework of future strategic alliance research

The above discussion suggests that SAs in the new era driven by digital transformation are experiencing substantially different changes to preceding decades, and these deserve more dedicated explanations and guidance for development. Although we are unable to provide definite suggestions for alternative theories in this short paper, we have attempted to hint at the possible future development of SA research. Table 4 compares the previous and future focus of SA research, potential research questions and possible application of theoretical perspectives which could offer new and effective explanations for the emerging phenomenon. The table also lists some studies that have relevance to the applications of such theories, albeit sparse. The intention of this table is not to close off the boundaries of future studies, but to stimulate more exciting future research in SA.

Table 4. Summary of strategic alliance studies and possible future research directions

Focus of SA research	Previous characteristics of SA	New characteristics of SA under digital transformation	Potential research questions	Possible future theoretical perspective	Relevant literature
Environment under which SAs operate	Static Embedded technological environment	Data-driven business models Open technological environment Fast-changing dynamic and blurred firm boundaries Business ecosystems	How should alliance strategy change with the faster-changing digital technological environment? How should the operation of SAs be adapted to meet the challenges of a new competitive environment? How should SA managers approach the challenges brought forward by the greater influence of stakeholders and players?	More use of DCV and KBV, or combined use of DCV and KBV to consider changing environments Extended RDT to reflect open access to resources More use of game theory, agency theory and stakeholder theory to consider new roles of players Integrated use of political theory Other new perspectives?	Jiang <i>et al.</i> (2017), Kohtamaki, Rabetino and Moller (2018), Krishnan, Geyskens and Steenkamp (2016), Lechler, Canzaniello and Hartmann (2018), Lee (2018), Neumann and Zollo (2017)
Motivations and benefits from the partnership	Access to resources and knowledge on a stable basis Market entry Linear functions of costs and benefits	Access to a wider array of resources and knowledge, in a more instant, ad hoc manner Heterogeneous, non-linear functions of various internal and external factors Co-evolutionary and co-creational SA	What will be the alternative SA business models and collaboration modes in digital transformation? What will determine the most effective business models for SA in the new competitive environment? What will be the SA social capital in digital transformation and how to manage such social capital? How will partners seek to maximize returns from SAs, given that such returns will be more heterogeneous?	More use of KBV, DCV or combined DCV and KBV to understand new alliances motives and mechanisms More extensive use of NRBV, stakeholder theory, agency theory and institutional theory to consider new motives, expectations and actors of SA SCT revisited to reflect non-human interactions More use of contingency theory to understand optimum SA options Better use of co-evolutionary perspective and DCV or combined use of the two Other new perspectives?	Bouncken and Fredrich (2016), Li and Wang (2019), Lin and Darmall (2015), Mollona, Neumann and Zollo (2018), Panico (2017), To (2016)
Nature of partnership	Static and stable longer-term relationship is the key Linear evolution of SA lifecycle	Dynamically transcend invisible organizational boundaries Curvilinear evolution of SA lifecycle	What will be the optimum relational characteristics of SA in the era of digital transformation? What will be necessary capabilities of firms, in order to manage SA successfully in digital transformation? How to manage the ambidexterity and risks of SA?	Combined use of RDT and DCV and contingency theory to explain the optimum alliances options in dynamic environments KBV extended to account for the increasing numbers of cross-sector alliances Stakeholder theory and agency theory revisited to consider wider roles of actors in alliance ecosystems SCT revisited to consider new and virtual relationship types, as well as extended relationships	Choi and Contractor (2016), Jiang <i>et al.</i> (2017), Keller <i>et al.</i> (2017), Klimas (2016), Robson <i>et al.</i> (2019)

Table 4. Continued

Focus of SA research	Previous characteristics of SA	New characteristics of SA under digital transformation	Potential research questions	Possible future theoretical perspective	Relevant literature
		<p>Ambidexterity of SA</p> <p>Decentralized alliance vs. longer-term concentrated alliance</p> <p>Flexible, agile, ad hoc and even virtual collaborations</p> <p>Cross-sector alliances</p> <p>Cooperative and hybrid partnerships</p> <p>Emerging alliance ecosystems</p>	<p>What will be the implications of shorter and curvilinear SA lifecycles for business operations, innovation management and IP protection?</p> <p>How will organizations balance flexible and ad hoc relationships with alliance maintenance?</p> <p>How to manage the scope, boundaries and evolution of alliance ecosystems?</p>	<p>Extended use of game theory to explain new relationship dynamics</p> <p>Combined use of organizational culture theories to consider new dynamics and interactions</p> <p>Other new perspectives?</p>	
Focus of alliance management	Optimizing formation of the alliance and maintenance of its ongoing performance	<p>Speedy identification and configuration of partnerships</p> <p>Constant redefine and reposition of partners</p> <p>Managing decentralized alliances</p> <p>Effective and speedy termination of partnerships</p> <p>Managing competition between alliance ecosystems</p>	<p>How can shorter SA lifecycles be effectively managed?</p> <p>How do firms internalize opportunities arising from more dynamic and ad hoc relationships with their SA partners?</p> <p>Which micro foundations will organizations require, in order to maximize returns from SA in the new era?</p>	<p>Contingency theory complimented by DCV or co-evolutionary theory to explain route to optimum alliance formation and outcomes</p> <p>KBV complemented by a political perspective taking account of the misappropriation of proprietary knowledge</p> <p>RDT extended or combine with institutional theory to take account of the political and social legitimacy that alliances require</p> <p>Extended use of game theory and agency theory to explain new relationship dynamics and outcomes</p> <p>Use of natural resource-based view of the firm to consider wider SA expectations</p> <p>Other new perspectives?</p>	<p>Al-Laham, Amburgey and Bates (2008), Albers, Wohlgezogen and Zajac (2013), Jiang <i>et al.</i> (2016), Li <i>et al.</i> (2017), Mollona, Neumann and Zollo (2018)</p>

Conclusion

Previous research into SAs has tended to follow a common array of management theories when investigating the SA phenomenon. Given a more dynamic business environment triggered by digital transformation, a more heterogeneous view of SAs is needed. We argue that it is time for the research community to review the existing assumptions behind theories underpinning SA research. As Child *et al.* (2019) argue, some of the most exciting and challenging advances in understanding SAs (including their dynamics) potentially can also arise from combining the insights of existing theories. The introduction of new theories, as well as the supplementary or alternative uses of existing theories, is needed to better reflect emerging SA business models.

Future research is needed to explore emerging SA management issues. For example, we have discussed the changes brought by digital transformation, highlighted the changing mode of SAs via a discussion of rapid change and discussed the direct implications for SA research of these changes. In particular, we have emphasized the dynamics across interfirm boundaries in today's SAs, the need for effective governance structures of different alliance types in the new era, the challenges of performance management given the new ambidextrous SA lifecycle and co-evolution, and future methodology requirements in the era of digital transformation.

Our propositions on the need for theory improvement in future research into SAs are based on emerging substantive questions, such as will the factors that made SAs successful in the past, still apply today and in the future? And will SA theory development be ready for this era of digital transformation? Our summary framework (Table 4) surfaces the need to consider the adoption of new or enhanced theories to explore important research questions, presented as four broad aspects. First, we consider the new environment in which SAs will be taking place, and ask how SA managers should respond to pressures from environmental dynamics and demanding stakeholders. Second, we ask what will motivate firms to engage in SAs in the era of digital transformation and what benefits such alliances will bring; this raises important questions about new business models and the maximization of returns for firms. Third, we question the nature

of partnerships in the new era, and point to the need for firms to build their capabilities in managing ambidextrous relationships. Finally, we consider a potential shift in the focus of alliance management, with a concern for shorter lifecycles and the maximization of returns from more dynamic partnerships on the one hand, and longer-term relationships required by emerging servitization and open innovation models on the other hand.

Through our previous discussion we seek to stimulate multidisciplinary theoretical reflections to better understand emerging paradoxes and challenges facing contemporary firms during the formation, development, optimization and resolution of multiphase (pre- and post-agreement) processes of SAs. We hope to encourage renewed multidisciplinary research surrounding SAs in the future through connecting, for instance, international business, political studies, cultural studies, financial markets, international trade and human resource management, and believe this will improve the underpinnings for research into an ongoing real-world phenomenon of SAs during an era of digital transformation.

References

- Albers, S., F. Wohlgezogen and E. J. Zajac (2013). 'Strategic alliance structures: an organization design perspective', *Journal of Management*, **42**, pp. 582–614.
- Al-Laham, A., T. L. Amburgey and K. Bates (2008). 'The dynamics of research alliances: examining the effect of alliance experience and partner characteristics on the speed of alliance entry in the biotech industry', *British Journal of Management*, **19**, pp. 343–364.
- Alvesson, M. and J. Sandberg (2011). 'Generating research questions through problematization', *Academy of Management Review*, **36**, pp. 247–271.
- Anand, J., R. Oriani and R. S. Vassolo (2010). 'Alliance activity as a dynamic capability in the face of a discontinuous technological change', *Organization Science*, **21**, pp. 1213–1232.
- Arranz, N., M. F. Arroyabe and J. C. F. D. Arroyabe (2017). 'Alliance-building process as inhibiting factor for SME international alliances', *British Journal of Management*, **27**, pp. 497–515.
- Arslan, B. (2018). 'The interplay of competitive and cooperative behavior and differential benefits in alliances', *Strategic Management Journal*, **39**, pp. 3222–3246.
- Balboni, B., G. Marchi and M. Vignola (2017). 'The moderating effect of trust on formal control mechanisms in international alliances', *European Management Review*, **15**, pp. 541–558.
- Barney, J. (1991). 'Firm resources and sustained competitive advantage', *Journal of Management*, **17**, pp. 99–120.
- Barney, J. B. (2001). 'Resource-based theories of competitive advantage: a ten-year retrospective on the resource-based view', *Journal of Management*, **27**, pp. 643–650.

- Barreto, I. (2010). 'Dynamic capabilities: a review of past research and an agenda for the future', *Journal of Management*, **36**, pp. 256–280.
- Bó, P. D. (2005). 'Cooperation under the shadow of the future: experimental evidence from infinitely repeated games', *American Economic Review*, **95**, pp. 1591–1604.
- Bogers, M., H. Chesbrough and C. Moedas (2018). 'Open innovation: research, practices, and policies', *California Management Review*, **60**, pp. 5–16.
- Bosse, D. A., R. A. Phillips and J. S. Harrison (2009). 'Stakeholders, reciprocity, and firm performance', *Strategic Management Journal*, **30**, pp. 447–456.
- Bouncken, R. B. and V. Fredrich (2016). 'Business model innovation in alliances: successful configurations', *Journal of Business Research*, **69**, pp. 3584–3590.
- Bronder, C. and R. Pritzl (1992). 'Developing strategic alliances: a conceptual framework for successful co-operation', *European Management Journal*, **10**, pp. 412–421.
- Brown, A. (1995). *Organizational Culture*. London: Pitman.
- Burt, R. S. (1992). *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.
- Burt, R. S. (1997). 'The contingent value of social capital', *Administrative Science Quarterly*, **42**, pp. 339–365.
- Busse, C., A. P. Kach and S. M. Wagner (2017). 'Boundary conditions: what they are, how to explore them, why we need them, and when to consider them', *Organizational Research Methods*, **20**, pp. 574–609.
- Bustinza, O. F., E. Gomes, F. Vendrell-Herrero and T. Baines (2019). 'Product–service innovation and performance: the role of collaborative partnerships and R&D intensity', *R&D Management*, **49**, pp. 33–45.
- Canzaniello, A., E. Hartmann and M. S. Fifka (2017). 'Intra-industry strategic alliances for managing sustainability-related supplier risks: motivation and outcome', *International Journal of Physical Distribution & Logistics Management*, **47**, pp. 387–409.
- Casciaro, T. and M. J. Piskorski (2005). 'Power imbalance, mutual dependence, and constraint absorption: a closer look at resource dependence theory', *Administrative Science Quarterly*, **50**, pp. 167–199.
- Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston, MA: Harvard Business Review Press.
- Chesbrough, H. and M. M. Appleyard (2007). 'Open innovation and strategy', *California Management Review*, **50**, pp. 57–77.
- Child, J., D. Faulkner, L. Hsieh and S. Tallman (2019). *Cooperative Strategy: Managing Alliances and Networks*. Oxford: Oxford University Press.
- Chiles, T. and J. McMackin (1996). 'Integrating variable risk preferences, trust, and transaction cost economics', *Academy of Management Review*, **21**, pp. 73–99.
- Choi, J. and F. J. Contractor (2016). 'Choosing an appropriate alliance governance mode: the role of institutional, cultural and geographical distance in international research & development (R&D) collaborations', *Journal of International Business Studies*, **47**, pp. 210–232.
- Christopher, M. (1998). *Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service* (2nd edn). London: FT Prentice Hall.
- Coase, R. H. (1937). 'The nature of the firm', *Economica*, **4**, pp. 386–405.
- Colombo, M. G. and L. Rabbiosi (2014). 'Technological similarity, post-acquisition R&D reorganization, and innovation performance in horizontal acquisitions', *Research Policy*, **43**, pp. 1039–1054.
- Cong, L. W. (2018). 'Navigating the next wave of blockchain innovation: smart contracts', MIT Sloan Management Review, September 26. Available at <https://sloanreview.mit.edu/article/navigating-the-next-wave-of-blockchain-innovation-smart-contracts/>
- Conner, K. R. and C. K. Prahalad (1996). 'A resource-based theory of the firm: knowledge versus opportunism', *Organization Science*, **7**, pp. 477–501.
- Cullen, J. B., J. L. Johnson and T. Sakano (2000). 'Success through commitment and trust: the soft side of strategic alliance management', *Journal of World Business*, **35**, pp. 223–240.
- Dacin, M. T., C. Oliver and J. P. Roy (2007). 'The legitimacy of strategic alliances: an institutional perspective', *Strategic Management Journal*, **28**, pp. 169–187.
- Dalenogare, L. S., G. B. Benitez, N. F. Ayala and A. G. Frank (2018). 'The expected contribution of Industry 4.0 technologies for industrial performance', *International Journal of Production Economics*, **204**, pp. 383–394.
- Das, T. K. (2006). 'Strategic alliance temporalities and partner opportunism', *British Journal of Management*, **17**, pp. 1–21.
- Das, T. K. and N. Rahman (2010). 'Determinants of partner opportunism in strategic alliances: a conceptual framework', *Journal of Business and Psychology*, **25**, pp. 55–74.
- Das, T. K. and B. Teng (2000). 'A resource-based theory of strategic alliances', *Journal of Management*, **26**, pp. 31–61.
- Das, T. K. and B. S. Teng (2002). 'Alliance constellations: asocial exchange perspective', *Academy of Management Journal*, **27**, pp. 445–456.
- Das, T. K. and B. S. Teng (1998). 'Between trust and control: developing confidence in partner cooperation in alliances', *Academy of Management Review*, **23**, pp. 491–512.
- Dawes, R. M. (1980). 'Social dilemmas', *Annual Review of Psychology*, **31**, pp. 169–193.
- Demirkan, H., J. C. Spohrer and J. J. Welser (2016). 'Digital innovation and strategic transformation', *IT Professional*, **18**, pp. 14–18.
- Devlin, G. and M. Bleackley (1988). 'Strategic alliances: guidelines for success', *Long Range Planning*, **21**, pp. 18–23.
- Dierickx, I. and K. Cool (1989). 'Asset stock accumulation and sustainability of competitive advantage', *Management Science*, **35**, pp. 1504–1511.
- Dimaggio, P. J. and W. W. Powell (1983). 'The iron cage revisited: institutional isomorphism and collective rationality in organizational fields', *American Sociological Review*, **48**, pp. 147–160.
- Donaldson, T. and L. E. Preston (1995). 'The stakeholder theory of the corporation: concepts, evidence, and implications', *Academy of Management Review*, **20**, pp. 65–91.
- Drees, J. M. and P. P. Heugens (2013). 'Synthesizing and extending resource dependence theory: a meta-analysis', *Journal of Management*, **39**, pp. 1666–1698.
- Dyer, J. H. (1997). 'Effective interim collaboration: how firms minimize transaction costs and maximize transaction value', *Strategic Management Journal*, **18**, pp. 535–556.
- Edelman (2020). 'Building trust through ethics'. Available at <https://www.edelman.co.uk/research/building-trust-through-ethics>, accessed 1 March, 2020.

- Eisenhardt, K. M. (1989). 'Agency theory: an assessment and review', *Academy of Management Review*, **14**, pp. 57–74.
- Eisenhardt, K. M. and J. A. Martin (2000). 'Dynamic capabilities: what are they?', *Strategic Management Journal*, **21**, pp. 1105–1121.
- Eisenhardt, K. and C. B. Schoonhoven (1996) 'Resource-based view of strategic alliance formation: strategic and social effects in entrepreneurial firms', *Organization Science*, **7**, pp. 136–150.
- Ertz, M., F. Durif and M. Arcand (2018). 'A conceptual perspective on collaborative consumption', *Academy of Marketing Science Review*, **9**, pp. 27–41.
- Fang, E. E. and S. Zou (2009). 'Antecedents and consequences of marketing dynamic capabilities in international joint ventures', *Journal of International Business Studies*, **40**, pp. 742–761.
- Ferrin, D. L., M. C. Bligh and J. C. Kohles (2007). 'Can I trust you to trust me? A theory of trust, monitoring, and cooperation in interpersonal and intergroup relationships', *Group & Organization Management*, **32**, pp. 465–499.
- Farooqar, R. (2018). 'Corporate elites are overlooking deglobalisation', *Financial Times*, October 14.
- Freeman, R. E. (1984) *Strategic Management: A Stakeholder Approach*. Cambridge: Cambridge University Press.
- Freeman, R. E., A. C. Wicks and B. Parmar (2004). 'Stakeholder theory and "the corporate objective revisited"', *Organization Science*, **15**, pp. 364–369.
- Friedman, A. L. and S. Miles (2002). 'Developing stakeholder theory', *Journal of Management Studies*, **39**, pp. 1–12.
- Gallear, D., A. Ghobadian and Q. He (2015). 'The mediating effect of environmental and ethical behaviour on supply chain partnership decisions and management appreciation of supplier partnership risks', *International Journal of Production Research*, **53**, pp. 6455–6472.
- Geringer, J. M. and L. Hébert (1989). 'Control and performance of international joint ventures', *Journal of International Business Studies*, **20**, pp. 235–254.
- Gomes, E., B. R. Barnes and T. Mahmood (2016). 'A 22 year review of strategic alliance research in the leading management journals', *International Business Review*, **25**, pp. 15–27.
- Gomes, E., M. Cohen and K. Mellahi (2013). 'When two African cultures collide: a study of interactions between managers in a strategic alliance between two African organizations'. In A. Newenham-Kahindi, K. N. Kamoche, A. Chizema and K. Mellahi (eds), *Effective People Management in Africa*, pp. 180–201. London: Palgrave Macmillan.
- Gomes, E., O. F. Bustinza, S. Tarba, Z. Khan and M. Ahammad (2019). 'Antecedents and implications of territorial servitization', *Regional Studies*, **53**, pp. 410–423.
- Grant, R. M. (1996). 'Toward a knowledge-based theory of the firm', *Strategic Management Journal*, **17**, pp. 109–122.
- Grant, R. M. and C. Baden-Fuller (1995). 'A knowledge-based theory of inter-firm collaboration', *Academy of Management Best Paper Proceedings*, **55**, pp. 17–21.
- Grant, R. M. and C. Baden-Fuller (2004). 'A knowledge accessing theory of strategic alliances', *Journal of Management Studies*, **41**, pp. 61–84.
- Gulati, R. (1999). 'Network location and learning: the influence of network resources and firm capabilities on alliance formation', *Strategic Management Journal*, **20**, pp. 397–420.
- Gulati, R. and H. Singh (1998). 'The architecture of cooperation: managing coordination costs and appropriation concerns in strategic alliances', *Administrative Science Quarterly*, **43**, pp. 781–814.
- Hamari, J., M. Sjöklint and A. Ukkonen (2016). 'The sharing economy: why people participate in collaborative consumption', *Journal of the Association for Information Science and Technology*, **67**, pp. 2047–2059.
- Hart, O. (2003). 'Incomplete contracts and public ownership: remarks, and an application to public-private partnerships', *The Economic Journal*, **113**, pp. C69–C76.
- Hart, S. L. (1995). 'A natural-resource-based view of the firm', *Academy of Management Review*, **20**, pp. 986–1014.
- Hart, S. and G. Dowell (2011). 'A natural-resource-based view of the firm: fifteen years after', *Journal of Management*, **37**, pp. 1464–1479.
- He, Q., A. Ghobadian and D. Gallear (2013). 'Knowledge acquisition in supply chain partnerships: the role of power', *International Journal of Production Economics*, **141**, pp. 605–618.
- Hecker, S., M. Haklay, A. Bowser, Z. Makuch, J. Vogel and A. Bonn (2018). *Innovation in Open Science, Society and Policy*. London: UCL Press.
- Hennart, J. F. (1988). 'A transaction costs theory of equity JVs', *Strategic Management Journal*, **9**, pp. 361–374.
- Hill, C. W. L. (1990). 'Cooperation, opportunism, and the invisible hand: implications for transaction cost theory', *Academy of Management Review*, **15**, pp. 500–513.
- Hillman, A. J., M. C. Withers and B. J. Collins (2009). 'Resource dependence theory: a review', *Journal of Management*, **35**, pp. 1404–1427.
- Hoffmann, W. H. (2007). 'Strategies for managing a portfolio of alliances', *Strategic Management Journal*, **28**, pp. 827–856.
- Houston, M. B. and S. A. Johnson (2000). 'Buyer-supplier contracts versus joint ventures: determinants and consequences of transaction structure', *Journal of Marketing Research*, **37**, pp. 1–15.
- Inkpen, A. C. and A. Dinur (1998). 'Knowledge management processes and international joint venture', *Organization Science*, **9**, pp. 454–468.
- James, B. G. (1985). 'Alliance: the new strategic focus', *Long Range Planning*, **18**, pp. 76–81.
- Jemison, D. B. (1987). 'Risk and the relationship among strategy, organization processes and performance', *Management Science*, **33**, pp. 1087–1101.
- Jensen, M. C. (2002). 'Value maximization, stakeholder theory, and the corporate objective function', *Business Ethics Quarterly*, **12**, pp. 235–256.
- Jiang, X., Y. Bao, Y. Xie and S. Gao (2016). 'Partner trustworthiness, knowledge flow in strategic alliances, and firm competitiveness: a contingency perspective', *Journal of Business Research*, **69**, pp. 804–814.
- Jiang, X., F. Jiang, A. Arino and M. W. Peng (2017). 'Uncertainty, adaptation, and alliance performance', *IEEE Transactions on Engineering Management*, **64**, pp. 605–615.
- Joshi, A. W. (1995). 'Long-term relationships, partnerships and strategic alliances: a contingency theory of relationship marketing', *Journal of Marketing Channels*, **4**, pp. 75–94.
- Judge, W. Q. and R. Dooley (2006). 'Strategic alliance outcomes: a transaction-cost economics perspective', *British Journal of Management*, **17**, pp. 23–37.
- Kale, P. and H. Singh (2007). 'Building firm capabilities through learning: the role of the alliance learning process in alliance capability and firm-level alliance success', *Strategic Management Journal*, **28**, pp. 981–1000.

- Kale, P., H. Singh and H. Perlmutter (2000). 'Learning and protection of proprietary assets in strategic alliances: building relational capital', *Strategic Management Journal*, **21**, pp. 217–237.
- Keller, A., F. Lumineau, T. Mellewigt and A. Arino (2017). 'Towards a revised typology of alliance governance', *Academy of Management Proceedings*, **2017**, art. 10842.
- Klimas, P. (2016) 'Organizational culture and cooptation: An exploratory study of the features, models and role in the Polish Aviation Industry', *Industrial Marketing Management*, **53**, pp. 91–102.
- Knocke, D. (2009). 'Playing well together: creating corporate social capital in strategic alliance networks', *American Behavioral Scientist*, **52**, pp. 1690–1708.
- Kogut, B. and U. Zander (1992). 'Knowledge of the firm, combinative capabilities, and the replication of technology', *Organization Science*, **3**, pp. 383–397.
- Kohtamäki, M., R. Rabetino and K. Moller (2018). 'Alliance capabilities: a systematic review and future research directions', *Industrial Marketing Management*, **68**, pp. 188–201.
- Koka, B. R. and J. E. Prescott (2002). 'Strategic alliances as social capital: a multidimensional view', *Strategic Management Journal*, **23**, pp. 795–816.
- Korpela, K., J. Hallikas and T. Dahlberg (2017). 'Digital supply chain transformation toward blockchain integration'. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.
- Krishnan, R., I. Geyskens and J.-B. E. M. Steenkamp (2016). 'The effectiveness of contractual and trust-based governance in strategic alliances under behavioral and environmental uncertainty', *Strategic Management Journal*, **37**, pp. 2521–2542.
- Kumar, A., V. Jain and S. Kumar (2014). 'A comprehensive environment friendly approach for supplier selection', *Omega*, **42**, pp. 109–123.
- Lane, P. J., A. A. J. Cannella and M. H. Lubatkin (1998). 'Agency problems as antecedents to unrelated mergers and diversification: Amihud and Lev reconsidered', *Strategic Management Journal*, **19**, pp. 555–578.
- Lavie, D. (2006). 'The competitive advantage of interconnected firms: an extension of the resource-based view', *Academy of Management Review*, **31**, pp. 638–658.
- Lawrence, T. B., C. Hardy and N. Phillips (2002). 'Institutional effects of inter-organizational collaboration: the emergence of proto-institutions', *Academy of Management Journal*, **45**, pp. 281–290.
- Lechler, S., A. Canzaniello and E. Hartmann (2018). 'Strategic alliances for the management of multi-tier supply chains with focus on sustainability', *Academy of Management Proceedings*, **2018**, art. 10799.
- Lee, M. and J. Jay (2015). 'Strategic responses to hybrid social ventures', *California Management Review*, **57**, pp. 126–147.
- Lee, Y. (2018). 'Match made in media? The dual role of media in cluster-spanning strategic alliances', *Academy of Management Proceedings*, **2018**, art. 13552.
- Li, L., F. Jiang, Y. Pei and N. Jiang (2017). 'Entrepreneurial orientation and strategic alliance success: the contingency role of relational factors', *Journal of Business Research*, **72**, pp. 46–56.
- Li, W. and L. Wang (2019). 'Strategic choices of exploration and exploitation alliances under market uncertainty', *Management Decision*, **57**, pp. 3112–3133.
- Lin, H. and N. Darnall (2015). 'Strategic alliance formation and structural configuration', *Journal of Business Ethics*, **127**, pp. 549–564.
- Lorange, P. and J. Roos (1992). *Strategic Alliances: Formation, Implementation, and Evolution*. Oxford: Blackwell.
- Lucas Jr, H. C., R. Agarwal, E. K. Clemons, O. A. El Sawy and B. Weber (2013). 'Impactful research on transformational information technology: an opportunity to inform new audiences', *MIS Quarterly*, **37**, pp. 371–382.
- Luo, Y. and J. Child (2015). 'A composition-based view of firm growth', *Management and Organization Review*, **11**, pp. 379–411.
- Mahoney, J. T., A. M. McGahan and C. N. Pitelis (2009). 'Perspective – the interdependence of private and public interests', *Organization Science*, **20**, pp. 1034–1052.
- Makadok, R. (2001). 'Toward a synthesis of the resource-based and dynamic-capability views of rent creation', *Strategic Management Journal*, **22**, pp. 387–401.
- March, J. and Z. Shapira (1987). 'Managerial perspectives on risk and risk taking', *Management Science*, **33**, pp. 1404–1418.
- Martin, J. (2002). *Organizational Culture*. Thousand Oaks, CA: Sage.
- Matt, C., T. Hess and A. Benlian (2015). 'Digital transformation strategies', *Business & Information Systems Engineering*, **57**, pp. 339–343.
- Meyer, J. W. and B. Rowan (1977). 'Institutionalized organizations: formal structure as myth and ceremony', *American Journal of Sociology*, **83**, pp. 340–363.
- Mindruta, D., M. Moeen and R. Agarwal (2016). 'A two-sided matching approach for partner selection and assessing complementarities in partners' attributes in inter-firm alliances', *Strategic Management Journal*, **37**, pp. 206–231.
- Mollona, E., K. Neumann and M. Zollo (2018). 'The co-evolutionary dynamics of trust and governance in strategic alliance', *Academy of Management Global Proceedings*, Tel Aviv. <https://journals.aom.org/doi/abs/10.5465/amgbproc.telaviv.2018.00229.abs>.
- Murray, J. Y. and M. Kotabe (2005). 'Performance implications of strategic fit between alliance attributes and alliance forms', *Journal of Business Research*, **58**, pp. 1525–1533.
- Nash, J. (1950). 'The bargaining problem', *Econometrica*, **18**, pp. 155–162.
- Neumann, K. and M. Zollo (2017). 'A stakeholder-based view of strategic alliances'. In L. F. Mesquita, R. Ragozzino and J. J. Reuer (eds), *Collaborative Strategy: Critical Issues for Alliances and Networks*, pp. 168–176. Cheltenham: Edward Elgar.
- Nooteboom, B., H. Berger and N. G. Nooriderhaven (1997). 'Effects of trust and governance on relational risk', *Academy of Management Journal*, **40**, pp. 308–338.
- Paiola, M., N. Saccani, M. Perona and H. Gebauer (2013). 'Moving from products to solutions: strategic approaches for developing capabilities', *European Management Journal*, **31**, pp. 390–409.
- Panico, C. (2017). 'Strategic interaction in alliances', *Strategic Management Journal*, **38**, pp. 1646–1667.
- Parkhe, A. (1993). 'Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation', *Academy of Management Journal*, **36**, pp. 794–829.
- Parkhe, A., E. C. Rosenthal and R. Chandran (1993). 'Prisoner's dilemma payoff structure in interfirm strategic alliances: an empirical test', *Omega*, **21**, pp. 531–539.

- Pennings, J. M. (1975). 'The relevance of the structural-contingency model for organizational effectiveness', *Administrative Science Quarterly*, **20**, pp. 393–410.
- Penrose, E. T. (1959). *The Theory of Growth of the Firm*. London: Basil Blackwell.
- Peteraf, M. A. (1993). 'The cornerstones of competitive advantage: a resource-based view', *Strategic Management Journal*, **14**, pp. 179–192.
- Pfeffer, J. (1972). 'Merger as a response to organizational interdependence', *Administrative Science Quarterly*, **17**, pp. 218–228.
- Pfeffer, J. and A. Leong (1977). 'Resource allocation in united funds: examination of power and dependence', *Social Forces*, **55**, pp. 775–790.
- Pfeffer, J. and G. R. Salancik (1978). *The External Control of Organizations – A Resource Dependence Perspective*. New York: Harper & Row.
- Porter, M. E. and J. E. Heppelmann (2014). 'How smart, connected products are transforming competition', *Harvard Business Review*, Nov, 3–23.
- Powell, W. and Dimaggio, P. (eds) (1991). *The New Institutionalism in Organizational Analysis*. Chicago, IL: University of Chicago Press.
- Rabetino, R., W. Harmsen, M. Kohtamäki and J. Sihvonen (2018). 'Structuring servitization-related research', *International Journal of Operations & Production Management*, **38**, pp. 350–371.
- Reuer, J. J. and K. D. Miller (1997). 'Agency costs and the performance implications of international joint venture internalization', *Strategic Management Journal*, **18**, pp. 425–438.
- Reuer, J. J. and R. Ragozzino (2006). 'Agency hazards and alliance portfolios', *Strategic Management Journal*, **27**, pp. 27–43.
- Robson, M. J., C. S. Katsikeas, B. B. Schlegelmilch and B. Prambock (2019). 'Alliance capabilities, interpartner attributes, and performance outcomes in international strategic alliances', *Journal of World Business*, **54**, pp. 137–153.
- Schallmo, D., C. A. Williams and L. Boardman (2017). 'Digital transformation of business models: best practice, enablers, and roadmap', *International Journal of Innovation Management*, **21**, art. 1740014.
- Schilke, O. (2014). 'On the contingent value of dynamic capabilities for competitive advantage: the nonlinear moderating effect of environmental dynamism', *Strategic Management Journal*, **35**, pp. 179–203.
- Scott, W. R. (1981). *Organizations: Rational, Natural, and Open Systems*. Englewood Cliffs, NJ: Prentice Hall.
- Simon, H. A. (1961). *Administrative Behavior* (2nd edn). New York: Macmillan.
- Sirmon, D. G., M. A. Hitt and R. D. Ireland (2007). 'Managing firm resources in dynamic environments to create value: looking inside the black box', *Academy of Management Review*, **32**, pp. 273–292.
- Song, D. - W. and P. M. Panayides (2002). 'A conceptual application of cooperative game theory to liner shipping strategic alliances', *Maritime Policy & Management*, **29**, pp. 285–301.
- Street, C. T. and A. - F. Cameron (2007). 'External relationships and the small business: a review of small business alliance and network research', *Journal of Small Business Management*, **45**, pp. 239–266.
- Tafti, A., S. Mithas and M. S. Krishnan (2013). 'The importance of IT-enabled flexibility in alliances', MIT Sloan Management Review, Spring. <https://sloanreview.mit.edu/article/the-importance-of-it-enabled-flexibility-in-alliances/>.
- Teece, D. J., G. Pisano and A. Shuen (1997). 'Dynamic capabilities and strategic management', *Strategic Management Journal*, **18**, pp. 509–533.
- To, C. K. M. (2016). 'Collaboration modes, preconditions, and contingencies in organizational alliance: a comparative assessment', *Journal of Business Research*, **69**, pp. 4737–4743.
- Todeva, E. and D. Knoke (2005). 'Strategic alliances and models of collaboration', *Management Decision*, **43**, pp. 123–148.
- Tsai, W. and S. Ghoshal (1998). 'Social capital and value creation: the role of intrafirm networks', *Academy of Management Journal*, **41**, pp. 464–476.
- Ustundag, A. and E. Cevikcan (2018). *Industry 4.0: Managing the Digital Transformation*. Cham: Springer.
- Vendrell-Herrero, F., E. Gomes, O. Bustinza and K. Mellahi (2018). 'Uncovering the role of cross-border strategic alliances and expertise decision centralization in enhancing product-service innovation in MMNEs', *International Business Review*, **27**, pp. 814–825.
- Vial, G. (2019). 'Understanding digital transformation: a review and a research agenda', *The Journal of Strategic Information Systems*, **28**, pp. 118–144.
- Von Neumann, J. and O. Morgenstern (1944). *The Theory of Games and Economic Behavior*. Princeton, NJ: Princeton University Press.
- Wassmer, U. (2010). 'Alliance portfolios: a review and research agenda', *Journal of Management*, **36**, pp. 141–171.
- Wernerfelt, B. (1984). 'A resource-based view of the firm', *Strategic Management Journal*, **5**, pp. 171–180.
- Williamson, O. E. (1981). 'The economics of organization: the transaction cost approach', *American Journal of Sociology*, **87**, pp. 548–577.
- Williamson, O. E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. London: Macmillan.
- Woodward, J. (1958). *Management and Technology*. London: Her Majesty's Stationery Office.
- Wright, P., A. Mukherji and M. J. Krollc (2001). 'A reexamination of agency theory assumptions: extensions and extrapolations', *Journal of Socio-Economics*, **30**, pp. 413–429.
- Wright, P., S. P. Ferris, A. Sarin and V. Awasthi (1996). 'The impact of corporate insider, blockholder, and institutional ownership on firm-risk taking', *Academy of Management Journal*, **39**, pp. 441–463.
- Xu, L. D., E. L. Xu and L. Li (2018). 'Industry 4.0: state of the art and future trends', *International Journal of Production Research*, **56**, pp. 2941–2962.
- Zimmermann, H. - D. and A. Pucihar (2015). 'Open innovation, open data and new business models'. In P. C. Doucek and V. Oskrdal (eds), Proceedings of IDIMT 2015 – 23rd Interdisciplinary Information and Management Talks, Pödebrady, Czech Republic, September 9–11, pp. 449–458. Linz: Trauner Verlag.

Qile He is Professor of Strategy and Performance Management at the University of Derby. He was previously the Associate Head of School for Research of the School of Strategy and Leadership at Coventry University and a Reader in Operations Management. He has published over 70 papers in refereed journals, books and leading international conference proceedings. He has supervised multiple PhD candidates to completion. He is a Council Member of the British Academy of Management.

Maureen Meadows is Professor of Strategic Management at the Centre for Business in Society (CBiS) at Coventry University. Formerly with the Open University Business School and Warwick Business School, Maureen's research interests include the use of strategy tools such as scenario planning and visioning by senior managers, and the post-merger integration phase following M&A deals. She is currently a member of BAM Council and the Co-Vice Chair (Special Interest Groups) at BAM.

Duncan Angwin is the Dean and Professor of Strategic Management at Nottingham University Business School. He has 30 years of practical and academic experience in strategy and mergers and acquisitions, has published 12 books (including the bestselling strategy textbook 'Exploring Strategy'), 50 research papers, and won multiple research grants including those from the EU, Oxford University and ICAEW.

Emanuel Gomes is an Associate Professor at Nova School of Business and Economics, Universidade Nova de Lisboa. His research interest is in the areas of M&A, strategic alliances, strategic renewal, strategic agility, product service innovation, microfoundations of strategy and firm internationalization, particularly in the African context. He is the author of various books, including *Mergers, Acquisitions and Strategic Alliances*, published by Palgrave Macmillan, and several papers published in international refereed journals.

John Child is Emeritus Professor of Commerce at the University of Birmingham. His degrees are all from the University of Cambridge. He is a Fellow of the Academy of Management, the Academy of International Business and the British Academy of Management. He is an elected Fellow of the prestigious British Academy [FBA]. He has published 27 books and over 150 articles primarily in the fields of international business and business organization. His most recent book, *Hierarchy*, appeared in 2019.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix A. Supporting information