

December 2003

Beyond Alignment: A Coevolutionary View of the Information Systems Strategy Process

Joe Peppard
Loughborough University

Karin Breu
Cranfield School of Management

Follow this and additional works at: <http://aisel.aisnet.org/icis2003>

Recommended Citation

Peppard, Joe and Breu, Karin, "Beyond Alignment: A Coevolutionary View of the Information Systems Strategy Process" (2003). *ICIS 2003 Proceedings*. 61.
<http://aisel.aisnet.org/icis2003/61>

This material is brought to you by the International Conference on Information Systems (ICIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICIS 2003 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

BEYOND ALIGNMENT: A COEVOLUTIONARY VIEW OF THE INFORMATION SYSTEMS STRATEGY PROCESS

Joe Peppard

The Business School
Loughborough University
Loughborough, Leicestershire UK
j.peppard@lboro.ac.uk

Karin Breu

Information Systems Research Centre
Cranfield School of Management
Cranfield, Bedfordshire UK
k.breu@cranfield.ac.uk

Abstract

How do organizations achieve and sustain the process of continuous adaptation and change that is necessary to realize strategic information systems alignment? While research has focused on developing deterministic alignment models and on identifying the factors that contribute to alignment, there is little understanding of the process as it evolves over time. In this paper, we propose that coevolution theory offers the opportunity to explore coevolving interactions, interrelationships, and effects as both IS and business strategies evolve. An initial model of this coevolution is presented that applies the key attributes and concepts of coevolution theory to strategic IS alignment. Future directions for advancing our work are highlighted.

Keywords: Strategic alignment, IS strategy, coevolutionary theory

Introduction

The sustained interest in strategic information systems alignment owes a great deal to research that continues to advance empirical evidence of its positive effects on IS and business success (Chan and Huff 1993; Sabherwal and Chan 2001). The notion of strategic alignment, as exposed in the literature, builds on three central arguments (Hirschheim and Sabherwal 2001). First, organizational performance depends on structures and capabilities that support the successful realization of strategic decisions; second, alignment is a two-way process, where business and IS strategies can act as mutual drivers; third, strategic IS alignment “is not an event but a *process* of continuous adaptation and change” (Henderson and Venkatraman 1993). While the former aspects are well rehearsed, it is still unclear how to achieve and sustain the process of strategic IS alignment over time.

Our aim in this paper is to address this question by advancing the coevolutionary perspective as a new lens for theorizing about the dynamic, complex, and interdependent relationships between business and IS strategies. We believe that coevolutionary theory can shed insightful light on this process for two reasons. First, its central concern is to understand organizational *adaptation* and *change* by analyzing the simultaneous or coevolutionary development of organizations and their environments. Second, coevolutionary theory “will inform any research in organization studies, which spans levels of analyses and involves adaptation over time” (Lewin and Volberda 1999, p. 520). In this quest, we respond to scholars who have been proposing “that the literature on IS alignment is beginning to mature and that future studies of alignment could benefit from... using established theories from IS or other disciplines” (Sabherwal and Chan 2001, p. 26).

The paper is structured into four sections. We commence with a cursory review of strategic IS alignment theory, tracing its historical development, summarizing contemporary alignment thinking, and eliciting its conceptual and practical constraints. We continue with a brief overview of coevolutionary theory and highlight its use in organization science. On presenting our first take in applying coevolutionary theory to the process of adaptation and change between business and IS strategies, we conclude the manuscript by indicating the implications of coevolutionary theory for empirical IS strategy research.

Strategic IS Alignment

Strategic alignment is based on the premise that the inability to realize value from IS investment is, in part, due to the lack of alignment between the business and IS strategies of the organization (Henderson and Venkatraman 1993). Since the late 1970s, a substantial body of work has been evolving that explores both theory and practice in this domain. In this section, we briefly trace the historical development of this thinking, following the structure outlined in Figure 1.

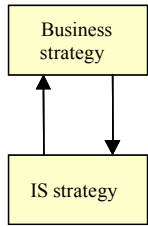
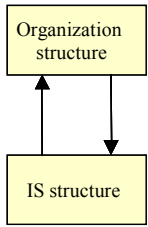
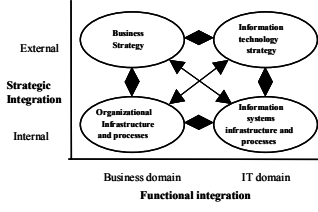
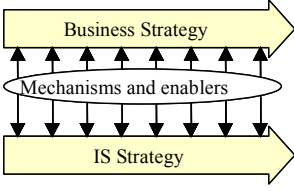
Focus	<p>Business Strategy - IS Alignment</p> 	<p>Business - IS Structural Alignment</p> 	<p>Strategic IS Alignment</p> 	<p>Alignment Mechanisms</p> 
Description	Align IS investment with business strategy. Tools and techniques such as value chain analysis, critical success factors, support the process.	Align IS structure with organization structure	Dynamic alignment between business strategic context and IT strategic context. Assesses range of strategic choices facing managers and how they interrelate. Process of continuous adaptation and change.	Identification of the key mechanisms and enablers of alignment in a dynamic context. Challenges assumption that IS and business should be kept separate. Explores conditions leading to sustainable competitive advantage.
References	Earl 1989 King 1978 Wiseman 1985	Ein-Dor and Segev 1982	Broadbent 1990 Broadbent and Weill 1993 Henderson and Venkatraman 1989, 1993	Ciborra 1994 Earl 1993 Keen 1993 Luftman and Brier 1999 Mata et al. 1995 Ross and Weill 2002
Proposition	Considers alignment as a strategic, top-down planning event.	Recognizes that strategy alone will not deliver alignment; stresses the importance of structural alignment.	Stresses the importance of strategic <i>and</i> structural alignment; recognizes that alignment is not an event but a process.	Critiques that the process view does not explain how variables interact; introduces mechanisms and enablers of alignment; does not show how to achieve sustained alignment over time.

Figure 1. Evolution of Strategic IS Alignment Thinking

Ever since the use of IS in organizations moved beyond automation and began seeking competitive advantage, there has been a considerable interest in developing more strategically oriented approaches to determine IS investments. Early approaches devised top-down strategic planning models “based on the assumption that an IS strategy can be planned and is often closely associated with the business strategy” (Peters et al. 2002, p. 25). The driver behind the process of IS strategy formulation under this view is to evaluate the impact of IS on business strategic options, while also aligning IS and business strategies (Earl 1989).

Yet, very early, researchers also recognized that the alignment of business and IS strategies would also require structural alignment between IS and the organization (Ein-Dor and Segev 1982). Structural alignment stresses the importance of structural fit between IS and the business, specifically in the areas of IS decision-making rights, reporting relationships, provision of IS services and infrastructure, and the deployment of IS personnel.

Acknowledging that alignment is not an event but a dynamic process, Henderson and Venkatraman (1989, 1993) proposed a model that represents the dynamic alignment between the business and IS strategic contexts, stressing the necessity for both strategic *and* structural alignment. Their conceptual model is based on the concepts of strategic integration and functional integration as a way of assessing the range and interrelationships of the strategic choices that managers face. They argue that alignment should at least involve four domains of strategic choice (i.e., business strategy, organizational infrastructure and processes, IS strategy, and IS infrastructure and processes) and that effective management requires a balance among the choices made across all four domains.

However, Henderson and Venkatraman's widely adopted model is still premised on the assumption that business and IS strategies are separate and distinct (Sauer and Burn 1997). Recent critiques of the concept of strategic alignment see this as a key reason for misalignment and the requirement for approaches to get business and IS strategies aligned in the first place. Yetton (1997) highlights the conundrum of alignment in that it is as much a problem to be managed as it is a solution. The focus of research within the most recent school of thought is on the integration and fusion of IS and the business, and attention has turned to the mechanisms and enablers of alignment in a context that is increasingly viewed as dynamic. Ciborra (1994), for instance, concluded from a study of a number of organizations that their achievement of competitive advantage from the deployment of IS was due more to serendipity than formal planning. He observed that IS alignment rather resembled a process of *bricolage*, improvisation and tinkering, than the execution of a preconceived strategy. From a study of 21 organizations, Earl (1993) concluded that his notion of the *organization approach* offered the best prospect for achieving alignment where IS decisions are made through continuous integration between the IS function and the rest of the organization. Key enablers and inhibitors of strategic alignment have been identified by Luftman and Brier (1999), while, recently, scholars have highlighted the importance of *informal networks of relationships* for achieving strategic IS alignment (Chan 2002) and have argued that "an effective IT governance structure is the single most important predictor of getting value from IT" (Weill and Woodham 2002).

Researchers examining the basis of sustainable competitive advantage through IS have also shed insight on how organizations achieve *alignment over time*. Examples of factors that are seen to help sustain alignment include developing superior IT management skills (Mata et al. 1995); mobilizing resources through IS competencies (Peppard et al. 2000); and business management's leadership role in key IT decisions (Ross and Weill 2002).

In summary, contemporary theory furnishes a detailed understanding of the factors involved in achieving strategic IS alignment. However, scholars have commented that, although alignment thinking is theoretically and conceptually consistent, the difficulties associated with its practical application in terms of achieving and sustaining alignment over time have been greatly underestimated (Hirschheim and Sabherwal 2001). Despite the recognition that strategic IS alignment is a process and not an event, its conception is still overly deterministic and little insight is available on how to *sustain* the dynamic and continuous process of adaptation and change between business and IS strategies. Perhaps the empirical study by Sabherwal et al. (2001), which uses the *punctuated equilibrium* model (cf. Gersick 1991) to examine the dynamics of alignment, is the beginning of a new genre in the study of IS alignment. Our research seeks to further develop this area and we suggest that coevolutionary theory can advance our understanding of the business-IS strategy relationship.

Coevolutionary Theory

The term *coevolution* was coined in the 1960s by the American population biologist Paul Ralph Ehrlich and the botanist Peter Hamilton Raven to refer to evolutionary changes that occur in genetically unrelated species as they interact with each other in their environment (Futuyma 1983). The notion of the simultaneous or coevolution of organisms and their environment has been applied to contemplation about the organization-environment relationship with the aim of understanding organizational adaptation, recognizing that the evolution of an organization cannot be understood independently from the simultaneous evolution of its environment (McKelvey 1997). Seminal work includes the application of coevolutionary theory to the analysis of the competitive advantage of nations (Porter 1990), strategic management (Barnett and Hansen 1996), strategic alliances (Koza and Lewin 1998), and new organizational forms (Lewin and Volberda 1999). Although coevolutionary theory receives increasing attention in the social sciences and organization theory, it has not yet been applied to the study of IS.

In contrast to evolutionary theories, which view organizations, populations, or other entities in isolation, the emerging coevolutionary perspective emphasizes the coupled evolution of multiple populations or forms (Amburgey and Singh 2002). Coevolutionary thinking appreciates the embeddedness of organizations in a complex socio-cultural and historical context, where forces of change and interactions conflux and reverberate. It also allows a dynamic view of the processes and forces acting upon the organization and its environment. In this paper, coevolution is defined as "the joint outcome of managerial intentionality, environment, and institutional effects" (Lewin and Volberda 1999, p. 526). Under a coevolutionary view, the fundamental characteristics of environments are uncertainty, complexity, munificence, graininess, fitness, and niches (McKelvey 1997), which shape a particular view of the relationship between an organization and its environment. Key characteristics of this relationship are summarized in Table 1.

Table 1. Properties of Coevolutionary Organization-Environment Relationships

ORGANIZATION-ENVIRONMENT RELATIONSHIP		
Characteristic	Description	Example of Application
Multilevel effects	Coevolutionary effects take place at multiple levels within firms (micro-coevolution) and between firms and their niche (macro-coevolution).	Organizational novelty (Crowston 1996); networks (Ruef 1996); organization design (Bruderer and Singh 1996)
Multidirectional causalities	Coevolutionary effects result from multidirectional causalities within a complex system of relationships where changes in variables are caused by changes in others.	Competition (Baum 1999); Micro- and macro-coevolutionary interdependencies (McKelvey 1997)
Nonlinearity	Coevolutionary effects are not tractable through a simple cause-effect logic of linear relations between independent and dependent variables.	Casti 1994
Positive feedback	Actions and interactions between firms and their environments are recursive and result in interdependencies and circular causality.	New organizational forms (Lewin and Volberda 1999)
Path and history dependencies	Adaptation is path- and history-dependent. Restricting and enabling constraints of organization path dependence.	Social structure (Stinchcombe 1965); markets and institutions (Kieser 1989); institutional models (Calori et al. 1997)
Smooth versus rugged fitness landscapes	Every time an organization's fitness changes, the fitness of its landscape changes. An increase in one firm's fitness results in a decrease of rival firms' fitness.	Levinthal (1997)

Organizations do not lead isolated lives but, instead, are linked inextricably with others. The success of one organization may, thus, be as much a function of what other organizations do as what the organization itself does. Moreover, a cluster of organizations inhabits a landscape (just as a species does) and landscapes are coupled with other landscapes. The actions of a firm, therefore, not only impinge on its own landscape but on other landscapes as well (Kauffman 1995).

An organization's prospect to coevolve successfully with its environment depends on a large number of factors, key among those are its fitness function, absorptive capacity, and value creation mode. The notion of the fitness function seeks to capture the idea of how well the organization fits the landscape, in terms of its capability for coping with disorder and uncertainty (Fombrun 1988). Absorptive capacity, which concerns a firm's ability to assimilate new knowledge, including the speed at which it can learn, has a mediating effect on the organization's adaptability (Cohen and Levinthal 1990). Value creation can be pursued through strategies of exploration and exploitation, an idea originally proposed by March's (1991) organizational learning model that links firm adaptation to changes in its population. Exploration concerns the strategy of prospecting for new landscapes to discover new opportunities for value creation. This involves innovation, research and development, venturing, risk-taking, developing new capabilities, and investing in the firm's absorptive capacity (Koza and Lewin 1998). Exploitation aims at increasing the productivity of existing capabilities and employed capital and assets. Environmental discontinuities such as new entrants or disruptive technology can promote new conditions for competition and destroy existing competencies (Tushman and Anderson 1986). Coevolutionary theory approaches its subject of study by identifying its (1) antecedent conditions; (2) coevolving activities, actions, and processes; and (3) their outcome (Koza and Lewin 1998). For instance, coevolutionary research has explained the emergence of new organization forms as an outcome of the coevolution of the competitive environment, firm intentionality, and institutional environment of the firm (Lewin and Volberda 1999), or how medieval guilds were replaced by mercantilist factories as markets and institutions coevolved (Kieser 1989).

Coevolutionary Theory Applied to the Business–IS Strategy Process

A coevolutionary view of the dynamic process of mutual adaptation and change of business and IS strategies, as depicted in Figure 2, provides us with a lens that transcends deterministic representations of strategic IS alignment. A coevolutionary stance allows us to view this phenomenon as the fuzzy, indeterminate, and complex process that more accurately reflects the authentic experience of organizational actors who seek to achieve and sustain alignment in practice (Mintzberg and McHugh 1985). Strategizing in practice is fuzzy because contemporary environments are hyperdynamic (e.g., the “red queen effect,” cf. Barnett and Hansen 1996; Van Valen 1973), the distinction between external and internal boundaries makes increasingly less sense (e.g., Internet effects, electronic supply chain integration, virtual organization, networks, c.f. Sampler 1998), and IS strategizing and implementation is far from being linear and predictable (e.g., tinkering, improvisation, c.f. Earl 1993; Ciborra 1994).

Strategic IS alignment, with its reliance on mechanistic processes of structural (e.g., social actors’ skills, formal relationships, informal networks, incentives, rewards, career plans) and strategic alignment (e.g., executive level communication, awareness, and commitment; linked missions, priorities, strategies, planning processes, plans), fails to acknowledge the decisive role of human agency—historical as well as contemporary, exogenous as well as endogenous—within this process. Taking a coevolutionary stance, however, allows us to frame the process of mutual adaptation and change between business and IS strategies not just as a matter of alignment but as a dynamic interplay of coevolving interactions, interrelationships and effects (indicated by the curve in the center of Figure 2) that is impacted by a complex set of dynamically changing forces (indicated by the triangles in Figure 2).

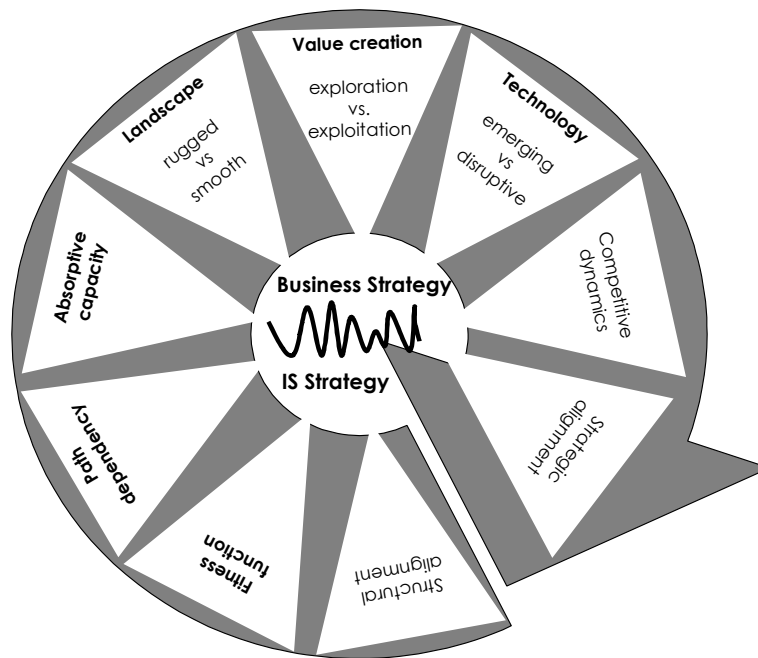


Figure 2. A Coevolutionary View of the Dynamic Process of Mutual Adaptation and Change between Business and IS Strategy (Coevolutionary Characteristics are in Bold)

We use the circular arrow in Figure 2 to illustrate that causalities are multidirectional, that change in one variable has multilevel effects on other variables, and that forces of change are nonlinear. The view of a coevolving relationship between business and IS strategies brings attention to fundamental, yet still unconsidered, factors that impinge this process. For instance, the conditions and outcomes of the business-IS strategy process are not only a function of structural and strategic alignment but also distinctly depend on whether the firm is pursuing exploration and/or exploitation strategies for value creation; whether the firm is operating in a rugged (highly correlated, reactive) or smooth landscape; whether technology is emerging or disruptive; the firm’s unique history and path dependency; its absorptive capacity; and its fitness function. The strategy process is not ahistorical. Coevolutionary theory takes account of antecedent conditions that influence the strategizing and implementation process, such as IS legacy, social actors’ mindsets, previous experiences of success and failure that shape social actors’ attitudes and

expectations of strategizing, or the historically problematic nature of the business-IS relationship. Further, current alignment theory does not account for variations in organizations' and social actors' adaptive capabilities, although they significantly influence the competitive impact a given strategy will have. A representation of the business-IS strategy process, therefore, is incomplete if factors are neglected such as the firm's absorptive capacity, path dependency, landscape, value creation strategy, and fitness relative to its rivals.

Next Stage of Work

Sabherwal and Chan (2001) have pointed out the need for further research to examine the factors that influence the alignment between business and IS strategies. In this research-in-progress paper, we have proposed that coevolutionary theory provides us with a lens for conceptualizing the business-IS strategy process anew, and as a way of overcoming the constraints of contemporary strategic IS alignment theory. These constraints result primarily from an overly mechanistic view of strategic IS alignment, the notion of planability and control implied by the language of alignment, and the neglect of human agency. Figure 2 represents our first attempt at applying coevolutionary theory to the business-IS strategy process. The set of forces identified in Figure 2 is illustrative and not yet comprehensive. As we further develop the model, through empirical research, we will aim to identify all of the relevant factors and their coevolving influences and relationships that impinge on the process.

Applying our ideas to empirical research will initially involve two major requirements. In a first step, we need to assess the empirical validity of the model represented in Figure 2 and its capacity for extending existing understanding of the IS strategy process. Our empirical study takes a qualitative research approach and explores, across a range of organizations and managers, the degree to which the six coevolutionary components in our model capture the IS strategy process in practice. The results of this work will refine our existing model and indicate the contribution that a coevolutionary approach can make. If this research establishes the significance of coevolutionary theory to understanding IS strategy practice, we then need, in a second step, to develop the implications of the model for practice. We expect, at this stage, that these implications would primarily be of an ontological nature, expanding managers' mindsets beyond deterministic views of the interrelationship between business and IS strategies and the expectations associated with prescriptive solutions to the problem of alignment.

There is recognition in the literature that the empirical realisation of coevolutionary research is demanding (Lewin and Volberda 1999). First, coevolutionary forces are multilevel, nonlinear and exhibit multidirectional causality. This poses a significant challenge for data collection. It is likely that some of the variables and interrelationships at force in a coevolutionary process are imperceptible and, thus, inaccessible for capture by practitioners and researchers alike. Second, coevolution is a historical process. This poses the requirement for empirical studies to take a long-term view—either retrospectively or real-time. The challenge of undertaking such research is, for retrospective studies, to have comprehensive historical data available, and, for real-time studies, to obtain longitudinal access to organisations. In addition, we need to define what the appropriate time-frame for such a study might be. Unfortunately, coevolutionary researchers have noted that “the time horizon for undertaking coevolution studies remains indeterminate” and that the existing literature “remains silent on this issue” (Lewin and Volberda 1999, p. 529). A whole strand of empirical research across varied time frames will be required to arrive at a sufficiently reliable idea of the longitudinal scope for such studies in the field of business-IS strategy coevolution.

References

- Barnett, W. P., and Hansen, M. T. “The Red Queen in Organizational Evolution,” *Strategic Management Journal* (17), 1996, pp. 139-157.
- Baum, J. A. C. “Whole-Part Coevolutionary Competition in Organizations,” in *Variations in Organization Science: In Honor of Donald T. Campbell*, J. A. C. Baum and B. McKelvey (eds.), Sage Publications, London, 1999, pp. 113-135.
- Broadbent, M. *The Alignment of Business and Information Strategies*, unpublished Ph.D. thesis, Graduate School of Management, University of Melbourne, Melbourne, Australia, 1990.
- Broadbent, M., and Weill, P. “Improving Business and Information Strategy Alignment: Learning from the Banking Industry,” *IBM Systems Journal* (32:1), 1993, pp. 162-179.
- Bruderer, E., and Singh, J. V. “Organizational Evolution, Learning, and Selection: A Genetic-Algorithm-Based Model,” *Academy of Management Journal* (35:5), 1996, pp. 1322-1349.
- Calori, R., Lubatkin, M., Very, P., and Veiga, J. F. “Modeling the Origins of Nationally Bound Administrative Heritages: A Historical Institutional Analysis of French and British Firms,” *Organization Science* (8:6), 1994, pp. 681-696.

- Casti, J. *Complexification: Explaining a Paradoxical World through the Science of Surprise*, HarperCollins, New York, 1994.
- Chan, Y. E. "Why Haven't We Mastered Alignment? The Importance of the Informal Organization Structure," *MIS Quarterly Executive* (1:2), 2002, pp. 97-112.
- Chan, Y. E., and Huff, S. L. "Investigating Information Systems Strategic Alignment," in *Proceedings of the Fourteenth International Conference on Information Systems*, J. I. DeGross, R. P. Bostrom, and D. Robey (eds.), Orlando, FL, 1993, pp. 345-363.
- Ciborra, C. "The Grassroots of IT and Strategy," in *Strategic Information Systems: A European Perspective*, C. Ciborra and T. Jelessi (eds.), John Wiley & Sons, Chichester, UK, 1994, pp. 3-24.
- Cohen, W. M., and Levinthal, D. A. "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* (35:1), 1990, pp. 128-152.
- Crowston, K. "An Approach to Evolutionary Organizational Forms," *Computational and Mathematical Organization Theory* (2), 1996, pp. 29-47.
- Earl, M. J. "Experiences in Strategic Information Systems Planning," *MIS Quarterly* (17:1), 1993, pp. 1-24.
- Earl, M. J. *Management Strategies for Information Technologies*, Prentice-Hall, Hemel Hempstead, UK, 1989.
- Ein-Dor, P., and Segev, E. "Organizational Computing and MIS Structure: Some Empirical Evidence," *MIS Quarterly* (6:3), 1982, pp. 55-68.
- Fombrun, C. J. "Crafting an Institutionally-Informed Ecology of Organizations," in *Ecological Models of Organizations*, G. R. Carroll (ed.) Ballinger, Cambridge, MA, 1988, pp. 223-239.
- Futuyma, D. J. *Coevolution*, Sinauer, Sunderland, MA, 1983.
- Gersick, C. J. G. "Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm," *Academy of Management Review* (16:1), 1991, pp. 10-36.
- Henderson, J. C., and Venkatraman, N. "Strategic Alignment: A Framework for Strategic Information Technology Management," Working Paper No. 190, Center for Information Systems Research, Massachusetts Institute of Technology, Cambridge, MA, 1989.
- Henderson, J. C., and Venkatraman, N. "Strategic Alignment: Leveraging Information Technology for Transforming Organizations," *IBM Systems Journal* (32:1), 1993, pp. 4-16.
- Hirschheim, R., and Sabherwal, R. "Detours in the Path toward Strategic Information Systems Alignment," *California Management Review* (44:1), 2001, pp. 87-108.
- Kauffman, S. A. "Technology and Evolution: Escaping the Red Queen Effect," *McKinsey Quarterly* (1), 1995, pp. 118-129.
- Keen, P. G. W. "Information Technology and the Management Difference: A Fusion Map," *IBM Systems Journal* (32:1), 1993, pp. 17-39.
- Kieser, A. "Organizational, Institutional, and Societal Evolution: Medieval Craft Guilds and the Genesis of Formal Organizations," *Administrative Science Quarterly* (34:4), 1989, pp. 540-564.
- King, W. R. "Strategic Planning for Management Information Systems," *MIS Quarterly* (2:1), 1978, pp. 22-37.
- Koza, M. P., and Lewin, A. Y. "The Coevolution of Strategic Alliances," *Organization Science* (9:3), 1998, pp. 255-264.
- Levinthal, D. A. "Adaptation on Rugged Landscapes," *Management Science* (43:7), 1997, pp. 934-950.
- Lewin, A. Y., and Volberda, H. W. "A Framework for Research on Strategy and New Organizational Forms," *Organization Science* (10:5), 1999, pp. 519-534.
- Luftman, J., and Brier, T. "Achieving and Sustaining Business-IT Alignment," *California Management Review* (Fall), 1999, pp. 109-122.
- March, J. G. "Exploration and Exploitation in Organizational Learning," *Organization Science* (2:1), 1991, pp. 71-87.
- Mata, F. J., Fuerst, W. L., and Barney, J. "Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis," *MIS Quarterly* (19), 1995, pp. 487-505.
- McKelvey, W. "Quasi-Natural Organization Science," *Organization Science* (8:4), 1997, pp. 352-380.
- Mintzberg, H., and McHugh, A. "Strategy Formulation in an Adhocracy," *Administrative Science Quarterly* (30), 1985, pp. 160-197.
- Ruef, M. "The Evolution of Convention: Conformity in Task-Oriented Networks," *Computational and Mathematical Organization Theory* (2), 1996, pp. 5-28.
- Peppard, J. W., Lambert, R., and Edwards, C. E. "Whose Job Is it Anyway? Organizational Information Competencies for Value Creation," *Information Systems Journal* (10:4), 2000, pp. 291-323.
- Peters, S. C. A., Heng, M. S. H., and Vet, R. "Formation of the Information Systems Strategy in a Global Financial Services Company," *Information and Organization* (12), 2002, pp. 19-38.
- Porter, M. *Competitive Advantage of Nations*, Oxford University Press, Oxford, UK, 1990.
- Ross, J. W., and Weill, P. "Six IT Decisions Your IT People Shouldn't Make," *Harvard Business Review* (November), 2002, pp. 85-91.

- Sabherwal, R., and Chan, Y. E. "Alignment between Business and IS Strategies: A Study of Prospectors, Analyzers and Defenders," *Information Systems Research* (12:1), 2001, pp. 11-33.
- Sabherwal, R., Hirschheim, R., and Goles, T. "The Dynamics of Alignment: Insights from a Punctuated Equilibrium Model," *Organization Science* (12:2), 2001, pp. 179-197.
- Sampler, J. "Refining Industry Structure for the Information Age," *Strategic Management Journal* (19), 1998, pp. 343-355.
- Sauer, C., and Burn, J. "The Pathology of Strategic Alignment," in *Steps to the Future: Fresh Thinking on the Management of IT-Based Organizational Transformation*, C. Sauer and P. W. Yetton (eds.), Jossey-Bass, San Francisco, 1997, pp. 89-111.
- Stinchcombe, A. L. "Organizations and Social Structure," in *Handbook of Organizations*, J. G. March (ed.), Rand McNally, Chicago, 1965, pp. 142-193.
- Tushman, M. L., and Anderson, P. "Technological Discontinuities and Organizational Environments," *Administrative Science Quarterly* (31:3), 1986, pp. 439-465.
- Van Valen, L. "A New Evolutionary Law," *Evolutionary Theory* (1), 1973, pp. 1-30.
- Weill, P., and Woodham, R. "Don't Just Lead, Govern: Implementing Effective IT Governance," Working Paper No. 326, Center for Information Systems Research, Massachusetts Institute of Technology, Cambridge, MA, 2002.
- Wiseman, C. *Strategy and Computers*, Dow Jones-Irwin, Homewood, IL, 1985.
- Yetton, P. W. "False Prophecies, Successful Practice, and Future Directions in IT Management," in *Steps to the Future: Fresh Thinking on the Management of IT-Based Organizational Transformation*, C. Sauer and P. W. Yetton (eds.), Jossey-Bass, San Francisco, pp. 27-54.