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REVIEW: THE RESOURCE-BASED VIEW AND INFORMATION SYSTEMS RESEARCH: REVIEW, EXTENSION, AND SUGGESTIONS FOR FUTURE RESEARCH[1]

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Abstract

Information systems researchers have a long tradition of drawing on theories from disciplines such as economics, computer science, psychology, and general management and using them in their own research. Because of this, the information systems field has become a rich tapestry of theoretical and conceptual foundations. As new theories are brought into the field, particularly theories that have become dominant in other areas, there may be a benefit in pausing to assess their use and contribution in an IS context. The purpose of this paper is to explore and critically evaluate use of the resource-based view of the firm (RBV) by IS researchers.

The paper provides a brief review of resource-based theory and then suggests extensions to make the RBV more useful for empirical IS research. First, a typology of key IS resources is presented, and these are then described using six traditional resource attributes. Second, we emphasize the particular importance of looking at both resource complementarity and moderating factors when studying IS resource effects on firm performance. Finally, we discuss three considerations that IS researchers need to address when using the RBV empirically. Eight sets of propositions are advanced to help guide future research.

Keywords: Resource-based view, organizational impacts of IS, information systems resources, competitive advantage, IS strategic planning, information resource management

[1]Jane Webster was the accepting senior editor for this paper.

Introduction

In 1992, Mahoney and Pandian outlined how the resource-based view of the firm (RBV) might be useful to the field of strategic management. One benefit of the theory, they noted, was that it encouraged a dialogue between scholars from a variety of perspectives, which they described as "good conversation." Since then, the strengths and weaknesses of the RBV have been vigorously debated in strategic management and other management disciplines (e.g., Barney 2001; Fahy and Smithee 1999; Foss 1998; Priem and Butler 2001a, 2001b).

Very little discussion on the resource-based view, however, has been conducted in the field of information systems. The RBV has been used in the IS field on a number of occasions (see the Appendix for a list of IS research studies using the RBV), yet there has been no effort to date to comprehensively evaluate its strengths and weaknesses. This paper outlines how the RBV can be useful to research in IS, and provides guidelines for how this research might be conducted. In short, the purpose of this paper is to initiate a discussion of the RBV within the conversation of information systems research.

The paper is organized as follows. First, we briefly introduce the resource-based view of the firm and describe how the theory has relevance for IS scholars. Second, we present a typology of IS resources and then describe, compare, and contrast them with one another using six key resource attributes. Third, we address the important issues of resource complementarity and the role played by moderating factors that influence the IS resource-firm performance relationship. We then turn to a discussion of three major sets of considerations that IS researchers need to address when using the RBV in empirical settings.

The Resource-Based View of the Firm

An Overview of the Resource-Based View

The resource-based view argues that firms possess resources, a subset of which enables them to achieve competitive advantage, and a further subset which leads to superior long-term performance (Barney 1991; Grant 1991; Penrose 1959; Wernerfelt 1984). Empirical studies of firm performance using the RBV have found differences not only between firms in the same industry (Hansen and Wernerfelt 1989), but also within the narrower confines of groups within industries (Cool and Schendel 1988). This suggests that the effects of individual, firm-specific resources on performance can be significant (Mahoney and Pandian 1992).

Resources that are valuable and rare and whose benefits can be appropriated by the owning (or controlling) firm provide it with a temporary competitive advantage. That advantage can be sustained over longer time periods to the extent that the firm is able to protect against resource imitation, transfer, or substitution. In general, empirical studies using the theory have strongly supported the resource-based view (e.g., McGrath et al. 1995; Miller and Shamsie 1996; Zaheer and Zaheer 1997).

One of the key challenges RBV theorists have faced is to define what is meant by a resource. Researchers and practitioners interested in the RBV have used a variety of different terms to talk about a firm's resources, including competencies (Prahalad and Hamel 1990), skills (Grant 1991), strategic assets (Amit and Schoemaker 1993), assets (Ross et al. 1996), and stocks (Capron and Hulland 1999). This proliferation of definitions and classifications has been problematic for research using the RBV, as it is often unclear what researchers mean by key terminology (Priem and Butler 2001a). In order to simplify the interpre-

tation of the theory, it is useful to clarify the definitions of relevant terms. In this paper, we define resources as *assets and capabilities that are available and useful in detecting and responding to market opportunities or threats* (Sanchez et al. 1996; see also Christensen and Overdorf 2000). Together, assets and capabilities define the set of resources available to the firm.

Assets are defined as anything tangible or intangible the firm can use in its processes for creating, producing, and/or offering its products (goods or services) to a market, whereas capabilities are repeatable patterns of actions in the use of assets to create, produce, and/or offer products to a market (Sanchez et al. 1996). Assets can serve as inputs to a process, or as the outputs of a process (Srivastava et al. 1998; Teece et al. 1997). Assets can be either tangible (e.g., information systems hardware, network infrastructure) or intangible (e.g., software patents, strong vendor relationships) (Hall 1997; Itami and Roehl 1987; Srivastava et al. 1998). In contrast, capabilities transform inputs into outputs of greater worth (Amit and Schoemaker 1993; Capron and Hulland 1999; Christensen and Overdorf 2000; Sanchez et al. 1996; Schoemaker and Amit 1994).[2] Capabilities can include skills, such as technical or managerial ability, or processes, such as systems development or integration.

What Can the Resource-Based View Contribute to IS Research?

A critical issue addressed in this review is the usefulness of the resource-based view to IS research. The RBV is increasingly being used by IS researchers and therefore it is valuable to pause and reflect on the actual utility of the theory to the IS field. That the theory has become influential in other management fields such as strategy and marketing merely points to its *potential* use in IS research. Usefulness in one field does not dictate usefulness in all fields. Furthermore, the IS field already incorporates theories from many other areas. This review will explore what, if anything, the RBV can offer that the IS field does not already obtain from elsewhere.

This review will argue that the RBV is indeed useful to IS research. The theory provides a valuable way for IS researchers to think about how information systems relate to firm strategy and performance. In particular, the theory provides a cogent framework to evaluate the strategic value of information systems resources. It also provides guidance on how to differentiate among various types of information systems—including the important distinction between information technology and information systems—and how to study their separate influences on performance (Santhanam and Hartono 2003). Further, the theory provides a basis for comparison between IS and non-IS resources, and thus can facilitate cross-functional research.

Yet, as currently conceptualized, the theory is not ideally suited to studying information systems. Unlike some resources, such as brand equity or financial assets, IS resources rarely contribute a direct influence to sustained competitive advantage (SCA). Instead, they form part of a complex chain of assets and capabilities that may lead to sustained performance. In the parlance of Clemons and Row (1991), information systems resources are necessary, but not sufficient, for SCA. Information systems exert their influence on the firm through complementary relationships with other firm assets and capabilities. While the RBV recognizes the role of resource complementarity, it is not well developed in the theory. The refinement of this element is necessary to enhance the usefulness of the RBV to IS researchers.

[2] In this paper we view the terms *capabilities*, *competencies*, and *core competencies* as essentially synonymous. According to Sanchez et al. (1996), the only difference between these terms lies in the fact that core competencies are capabilities that achieve competitive advantage. Because we explicitly discuss only capabilities that lead to superior performance, in this paper the terms can be considered interchangeable.

We recognize three aspects of the RBV that provide rare and valuable benefits to IS researchers. First, by way of a defined set of resource attributes, the RBV facilitates the specification of information systems resources. This specification provides the groundwork for a set of mutually exclusive and exhaustive information systems assets and capabilities. This review suggests a framework for this IS resource set. Second, by using the same set of resource attributes mentioned above, IS resources can be compared with one another and, perhaps more importantly, can be compared with non-IS resources. Thus, the RBV promotes cross-functional research through comparisons with other firm resources. Third, the RBV sets out a clear link between resources and SCA through a well-defined dependent variable, providing a useful way to measure the strategic value of IS resources. In addition, we recognize one area in which the theory is deficient as conceived—the complementarity of resources—and suggest a way to extend the theory to reduce the effect of this deficiency. We also suggest key moderating variables that are relevant to studies of the IS resource-performance relationship and that we believe warrant greater attention from IS researchers.

IS Resources and the Resource-Based View

This section starts by reviewing RBV research conducted to date within the IS field, with an eye to identifying the major IS resources used in these studies. These resources are then organized using a typology proposed by Day (1994). This is followed by a description of six key resource attributes that have been employed by RBV researchers in the past. Finally, we describe each of the major IS resources identified previously using these six attributes.

Information Systems Resources

The resource-based view started to appear in IS research in the mid-1990s (see the Appendix for a list of RBV studies conducted to date in the IS field). Much of this work has attempted to identify and define either a single IS resource or sets of IS resources. For example, Ross et al. (1996) divided IS into three *IT assets* which together with *IT processes* would contribute to business value. These three IT assets were labeled human assets (e.g., technical skills, business understanding, problem-solving orientation), technology assets (e.g., physical IT assets, technical platforms, databases, architectures, standards) and relationship assets (e.g., partnerships with other divisions, client relationships, top management sponsorship, shared risk and responsibility). IT processes were defined as planning ability, cost effective operations and support, and fast delivery. This categorization was later modified by Bharadwaj (2000) to include IT infrastructure, human IT resources, and IT-enabled intangibles.

Other categorization schemes have also been developed. (The Appendix summarizes these studies. In Table 2, presented later in the paper, we offer an alternative way of categorizing these constructs.) Feeny and Willcocks (1998) identified nine core IS capabilities, which they organized into four overlapping areas. These areas were business and IT vision (integration between IT and other parts of the firm), design of IT architectures (IT development skills), delivery of IS services (implementation, dealing with vendors and customers), and a core set of capabilities which included IS leadership and informed buying. As a further step, each capability was ranked as to how much it relied on business, technical, or interpersonal skills. Bharadwaj et al. (1998) suggested and subsequently validated a measure of IT capability with the following six dimensions: IT/business partnerships, external IT linkages, business IT strategic thinking, IT business process integration, IT management, and IT infrastructure. Each dimension was found to be reliable and valid using psychometric testing on a sample of senior IS executives.

The link between IS resources and firm performance has been investigated by a number of researchers. For example, Mata et al. (1995) used resource-based arguments to suggest that

five key IS drivers—customer switching costs, access to capital, proprietary technology, technical IT skills, and managerial IT skills—lead to sustained competitive advantage, although they found empirical support for only the last of these proposed relationships. Powell and Dent-Micallef (1997) divided information systems resources into three categories: human resources, business resources, and technology resources. In a study of the U.S. retail industry, they found that only human resources in concert with IT contributed to improved performance. Among the business resources, only IT training positively affected performance, while no technology resources linked positively to performance at all.

Using an approach similar to that employed by Kohli and Jaworski (1990) to develop the *marketing orientation* construct, Marchand et al. (2000) proposed an *information orientation* construct comprised of three elements: information technology practices (the management of technology), information management practices (the management of information collection, organization and use), and information behaviors and values (behaviors and values of people using the information). These factors were validated using data from a large-scale cross-sectional survey. The study also found that firms ranking highly on all three information orientation dimensions tended to have superior performance when compared to other firms.

Many of the studies mentioned above divided IS resources into two categories that can be broadly defined as IS assets (technology-based) and IS capabilities (systems-based). Research has suggested that IS assets (e.g., infrastructure) are the easiest resources for competitors to copy and, therefore, represent the most fragile source of sustainable competitive advantage for a firm (Leonard-Barton 1992; Teece et al. 1997). In contrast, there is growing evidence that competitive advantage often depends on the firm's superior deployment of capabilities (Christensen and Overdorf 2000; Day 1994) as well as intangible assets (Hall 1997; Itami and Roehl 1987; Srivistava et al. 1998). From an RBV perspective, this advantage may result from development of capabilities over an extended period of time that become embedded in a company and are difficult to trade. Alternatively, the firm may possess a capability that is idiosyncratic to the firm (i.e., an IS expert with specialized knowledge who is loyal to the firm) or difficult to imitate due to path dependencies (Dierickx and Cool 1989) or embeddedness in a firm's culture (Barney 1991). Capabilities are often critical drivers of firm performance (Eisenhardt and Martin 2000; Makadok 2001; Teece et al. 1997).

A Typology of IS Resources

Day (1994) suggests one approach to thinking about IS resources. He argues that the capabilities (as previously noted, a subset of the firm's resources) held by a firm can be sorted into three types of processes: inside-out, outside-in, and spanning. *Inside-out* capabilities are deployed from inside the firm in response to market requirements and opportunities, and tend to be internally focused (e.g., technology development, cost controls). In contrast, *outside-in* capabilities are externally oriented, placing an emphasis on anticipating market requirements, creating durable customer relationships, and understanding competitors (e.g., market responsiveness, managing external relationships). Finally, *spanning* capabilities, which involve both internal and external analysis, are needed to integrate the firm's inside-out and outside-in capabilities (e.g., managing IS/business partnerships, IS management and planning). Such an approach is entirely consistent with Santhanam and Hartono's (2003) recent call to develop theoretically-based multidimensional measures of IT capability.

Table 1 suggests how eight key IS resources described in previous research can be organized within this framework. While this earlier work has used a variety of different terms for IS resources, it can be mapped directly onto Day's framework, as shown in Table 2. Each of the resources in this table is described more fully below.

Table 1. A Typology of IS Resources

Outside-In	Spanning	Inside-Out
• External relationship management • Market responsiveness	• IS-business partnerships • IS planning and change management	• IS infrastructure • IS technical skills • IS development • Cost effective IS operations

Table 2. A Categorization of Information Systems Resources from Previous Studies

Resource	Source
Manage external relationships	Manage external linkages (Bharadwaj et al. 1998) Manage stakeholder relationships (Benjamin and Levinson 1993) Strong community networks (Jarvenpaa and Leidner 1998) Contract facilitation (Feeny and Willcocks 1998) Informed buying (Feeny and Willcocks 1998) Vendor development (Feeny and Willcocks 1998) Contract monitoring (Feeny and Willcocks 1998) Coordination of buyers and suppliers (Bharadwaj 2000) Customer service (Bharadwaj 2000)
Market responsiveness	Fast delivery (Ross et al. 1996) Ability to act quickly (Bharadwaj 2000) Increased market responsiveness (Bharadwaj 2000) Responsiveness (Zaheer and Zaheer 1997) Fast product life cycle (Feeny and Ives 1990) Capacity to frequently update information (Lopes and Galletta 1997) Strategic flexibility (Jarvenpaa and Leidner 1998) Flexible IT systems (Bharadwaj 2000) Organizational flexibility (Powell and Dent-Micallef 1997)
IS-business partnerships (manage internal relationships)	Integrate IT and business processes (Benjamin and Levinson 1993; Bharadwaj 2000; Bharadwaj et al. 1998) Capacity to understand the effect of IT on other business areas (Benjamin and Levinson 1993) IT/business partnerships (Bharadwaj et al. 1998; Ross et al. 1996) Aligned IT planning (Ross et al. 1996) Business/IT strategic thinking (Bharadwaj et al. 1998) IT/business synergy (Bharawdaj 2000; Jarvenpaa and Leidner 1998) IT assimilation (Armstrong and Sambamurthy 1999) Relationship building (Feeny and Willcocks 1998) IT/strategy integration (Powell and Dent-Micallef 1997)

Table 2. A Categorization of Information Systems Resources from Previous Studies (Continued)	
IS planning and change management	IT management skills (Bharadwaj 2000; Bharadwaj et al. 1998; Mata et al. 1995) Business understanding (Feeny and Willcocks 1998; Ross et al. 1996) Problem solving orientation (Ross et al. 1996) Business systems thinking (Feeny and Willcocks 1998) Capacity to manage IT change (Benjamin and Levinson 1993) Information management practices (Marchand et al. 2000) Manage architectures/standards (Ross et al. 1996) Architecture planning (Feeny and Willcocks 1998)
IS infrastructure	IT infrastructure (Armstrong and Sambamurthy 1999; Bharadwaj 2000; Bharadwaj et al. 1998) Proprietary technology (Mata et al. 1995) Hard infrastructure (Benjamin and Levinson 1993) Soft infrastructure (Benjamin and Levinson 1993) Storage and transmission assets (Lopes and Galletta 1997) Information processing capacity (Lopes and Galletta 1997) Technology asset (Ross et al. 1996) Information technology practices (Marchand et al. 2000)
IS technical skills	Technical IT skills (Bharawdaj 2000; Feeny and Willcocks 1998; Mata et al. 1995; Ross et al. 1996) Knowledge assets (Bharadwaj 2000) Using knowledge assets (Bharadwaj 2000)
IS development	Technical innovation (Bharadwaj 2000) Experimentation with new technology (Jarvenpaa and Leidner 1998) Capacity to develop services that utilize interactive multimedia (Lopes and Galletta 1997) Alertness (Zaheer and Zaheer 1997)
Cost effective IS operations	Cost effective operations and support (Ross et al. 1996) Getting IT to function (Feeny and Willcocks 1998) Enhanced product quality (Bharadwaj 2000)

Outside-In Resources

External relationship management. This resource represents the firm's ability to manage linkages between the IS function and stakeholders outside the firm. It can manifest itself as an ability to work with suppliers to develop appropriate systems and infrastructure requirements for the firm (Feeny and Willcocks 1998), to manage relationships with outsourcing partners (Benjamin and Levinson 1993; Feeny and Willcocks 1998), or to manage customer relationships by providing solutions, support, and/or customer service (Bharadwaj 2000; Bharadwaj et al. 1998). Many large IS departments rely on external partners for a significant portion of their work. The ability to work with and manage these relationships is an important organizational resource leading to competitive advantage and superior firm performance.

Market responsiveness. Market responsiveness involves both the collection of information from sources external to the firm as well as the dissemination of a firm's market intelligence across

departments, and the organization's response to that learning (Day 1994; Kohli and Jaworski 1990). It includes the abilities to develop and manage projects rapidly (Ross et al. 1996) and to react quickly to changes in market conditions (Bharadwaj 2000; Feeny and Ives 1990; Zaheer and Zaheer 1997). A key aspect of market responsiveness is strategic flexibility, which allows the organization to undertake strategic change when necessary (Bharadwaj 2000; Jarvenpaa and Leidner 1998; Powell and Dent-Micallef 1997).

Spanning Resources

IS-business partnerships. This capability represents the processes of integration and alignment between the IS function and other functional areas or departments of the firm. The importance of IS alignment, particularly with business strategy, has been well documented (e.g., Chan et al. 1997; Reich and Benbasat 1996). This resource has variously been referred to as *synergy* (Bharadwaj 2000; Jarvenpaa and Leidner 1999), *assimilation* (Armstrong and Sambamurthy 1999), and *partnerships* (Bharadwaj et al. 1998; Ross et al. 1996). All of these studies recognize the importance of building relationships internally within the firm between the IS function and other areas or departments. Such relationships help to span the traditional gaps that exist between functions and departments, resulting in superior competitive position and firm performance. An element of this resource is the support for collaboration within the firm.

IS planning and change management. The capability to plan, manage, and use appropriate technology architectures and standards also helps to span these gaps. Key aspects of this resource include the ability to anticipate future changes and growth, to choose platforms (including hardware, network, and software standards) that can accommodate this change (Feeny and Willcocks 1998; Ross et al. 1996), and to effectively manage the resulting technology change and growth (Bharadwaj et al. 1998; Mata et al. 1995). This resource has been defined variously in previous research as "understanding the business case" (Feeny and Willcocks 1998; Ross et al. 1996), "problem solving orientation" (Ross et al. 1996), and "capacity to manage IT change" (Benjamin and Levinson 1993). It includes the ability of IS managers to understand how technologies can and should be used, as well as how to motivate and manage IS personnel through the change process (Bharadwaj 2000).

Inside-Out Resources

IS infrastructure. Most studies recognize that many components of IS infrastructure (such as off-the-shelf computer hardware and software) convey no particular strategic benefit due to lack of rarity, ease of imitation, and ready mobility. Thus, the types of IS infrastructure mentioned in most of the existing RBV-IS studies are either proprietary or complex and hard to imitate (Benjamin and Levinson 1993; Lopes and Galletta 1997). Despite these attempts to focus on the non-imitable aspects of IS infrastructure, the IS infrastructure resource has generally not been found to be a source of sustained competitive advantage for firms (Mata et al. 1995; Powell and Dent-Micallef 1997; Ray et al. 2001).

IS technical skills. IS technical skills are a result of the appropriate, updated technology skills, relating to both systems hardware and software, that are held by the IS/IT employees of a firm (Bharadwaj 2000; Ross et al. 1996). Such skills do not include only current technical knowledge, but also the ability to deploy, use, and manage that knowledge. Thus, this resource is focused on technical skills that are advanced, complex, and, therefore, difficult to imitate. Although the relative mobility of IS/IT personnel tends to be high, some IS skills cannot be easily transferred, such as corporate-level knowledge assets (Bharadwaj 2000) and technology integration skills (Feeny and Willcocks 1998), and, thus, these resources can become a source of sustained competitive advantage. This capability is focused primarily on the present.

IS development. IS development refers to the capability to develop or experiment with new

technologies (Bharadwaj 2000; Jarvenpaa and Leidner 1998; Lopes and Galletta 1997), as well as a general level of alertness to emerging technologies and trends that allow a firm to quickly take advantage of new advances (Zaheer and Zaheer 1997). Thus, IS development is future-oriented. IS development includes capabilities associated with managing a systems development life-cycle that is capable of supporting competitive advantage (Bharadwaj 2000; Marchand et al. 2000; Ross et al. 1996), and should therefore lead to superior firm performance.

Cost effective IS operations. This resource encompasses the ability to provide efficient and cost-effective IS operations on an ongoing basis. Firms with greater efficiency can develop a long-term competitive advantage by using this capability to reduce costs and develop a cost leadership position in their industry (Barney 1991; Porter 1985). In the context of IS operations, the ability to avoid large, persistent cost overruns, unnecessary downtime, and system failure is likely to be an important precursor to superior performance (Ross et al. 1996). Furthermore, the ability to develop and manage IT systems of appropriate quality that function effectively can be expected to have a positive impact on performance (Bharadwaj 2000; Feeny and Willcocks 1998).

Resource Attributes

In order to explore the usefulness of the RBV for IS research, it is necessary to explicitly recognize the characteristics and attributes of resources that lead them to become strategically important. Although firms possess many resources, only a few of these have the potential to lead the firm to a position of sustained competitive advantage. What is it, then, that separates regular resources from those that confer a sustainable strategic benefit? RBV theorists have approached this question by identifying sets of resource *attributes* that might conceptually influence a firm's competitive position. Under this view, only resources exhibiting all of these attributes can lead to a sustained competitive advantage (SCA) for the firm.[3] For example, Barney (1991) suggested that advantage-creating resources must possess four key attributes: value, rareness, inimitability, and non-substitutability. Other typologies have been proposed by Amit and Schoemaker (1993), Black and Boal (1994), Collis and Montgomery (1995), and Grant (1991). Although the terms employed across these frameworks are somewhat different, all attempt to link the heterogeneous, imperfectly mobile, and inimitable, firm-specific resource sets possessed by firms to their competitive positions. Before suggesting how the IS resources identified above can be described using these attributes, we first discuss these attributes more generally as they are viewed in the context of the RBV.

Some researchers have made the useful distinction between resources that help the firm *attain* a competitive advantage and those that help the firm to *sustain* that advantage (e.g., Piccoli et al. 2002; Priem and Butler 2001a). Borrowing from terminology used by Peteraf (1993), these two types of resource attributes can be thought of as, respectively, *ex ante* and *ex post* limits to competition. Most previous research using the RBV has blurred these two phases, but we believe that they need to be considered separately.

Ex ante limits to competition suggest that prior to any firm's establishing a superior resource position, there must be limited competition for that position. If any firm wishing to do so can acquire and deploy resources to achieve the position, it cannot by definition be *superior*. Attributes in this category include value, rarity, and appropriability. Firm resources can only be a source of SCA when they are valuable. A resource has *value* in an RBV context when it enables a firm to implement strategies that improve efficiency and effectiveness (Barney 1991). Resources with little or no

[3]RBV theory is built on the assumption that all resource attributes must be present for that resource to support a sustained competitive advantage. While most empirical work using the RBV has supported this view, a few studies have found results that are inconsistent with this assumption (e.g., Ainuddin 2000; Poppo and Zenger 1998). The key point here is that this assumption is empirically testable, opening the RBV to potential falsification (see also Barney 2001).

value have a limited possibility of conferring an SCA on the possessing firm. To take an extreme example, the use of a new, innovative paper clip design may set one firm apart from others, but it is unlikely the paper clip design would be valuable from a competitive advantage standpoint.[4]

Resources that are valuable cannot become sources of competitive advantage if they are in plentiful supply. *Rarity* refers to the condition where the resource is not simultaneously available to a large number of firms (Amit and Schoemaker 1993). For example, an ATM network might have significant value to a bank, but since it is not rare, it is unlikely to confer a strategic benefit.

The *appropriability* of a resource relates to its rent earning potential (Amit and Schoemaker 1993; Collis and Montgomery 1995; Grant 1991). The advantage created by a rare and valuable resource or by a combination of resources may not be of major benefit if the firm is unable to appropriate the returns accruing from the advantage. Technical skills provide an example of this phenomenon. The additional benefit accruable to a firm from hiring employees with rare and valuable technical skills may be appropriated away by the employee through higher than normal wage demands.[5] Similarly, a computer component supplier may be unable to enjoy the benefits of improved cost efficiencies if the computer manufacturer (i.e., the buyer) is sufficiently powerful to appropriate away such benefits. This might be done by sharing the learning with other suppliers, or by pitting more efficient suppliers against one another, forcing them to set lower prices than they might otherwise establish in order to win the business.

Ex post limits to competition mean that subsequent to a firm's gaining a superior position and earning rents, there must be forces that limit competition for those rents (Hidding 2001; Peteraf 1993). Attributes in this category include imitability, substitutability, and mobility.

In order to sustain a competitive advantage, firms must be able to defend that advantage against imitation.[6] The advantage accruing from newly developed features of computer hardware, for instance, are typically short-lived since competitors are able to quickly duplicate the technology (Mata et al. 1995). According to Barney (1991), there are three factors that can contribute to low *imitability*: unique firm history, causal ambiguity, and social complexity. The role of history recognizes the importance of a firm's unique past, a past that other firms are no longer able to duplicate—the so-called Ricardian argument. For example, a firm might purchase a piece of land at one point in time that subsequently becomes very valuable (Hirshleifer 1980; Ricardo 1966). Causal ambiguity exists when the link between a resource and the competitive advantage it confers is poorly understood. This ambiguity may lie in uncertainty about *how* a resource leads to SCA, or it may lie in lack of clarity about *which* resource (or combination of resources) leads to SCA. Such ambiguity makes it extremely hard for competing firms to duplicate a resource or copy the way in which it is deployed (Alchian 1950; Barney 1986 1991; Dierickx and Cool 1989; Lippman and Rumelt 1982; Reed and DeFillipe 1990). If a firm understands how and why its resources lead to SCA, then competing firms can take steps to acquire that knowledge, such as hiring away key personnel, or closely observing firm processes and outcomes. Finally, social complexity refers to the multifarious relationships within the firm and

[4]An extensive discussion of the concept of value in relation to resource-based theory has been conducted in the strategic management literature (Barney 2001; Priem and Butler 2001a, 2001b; Makadok 2001). Most of this discussion has focused on whether or not value can be determined endogenously to the theory. The contention that resource value is a pre-cursor to SCA has not been in dispute.

[5]For example, firms attempting to hire ERP-knowledgeable personnel during the 1999-2000 period discovered that they were able to appropriate only part of the potential rents associated with this resource, with the balance appropriated by the employees themselves (in the form of higher wages or compensation).

[6]It is important to note, however, that firms may not always be able to mount such defenses as a result of either not fully understanding the threat of imitation or not having the necessary resources to counter it.

between the firm and key stakeholders such as shareholders, suppliers, and customers (Hambrick 1987; Klein and Lefler 1981). The complexity of these relationships makes them difficult to manage and even more difficult to imitate. An example of this is Wal-Mart's logistics management system. Even if all the individual elements are in place, the relationships between the elements, and thus its complexity, would likely result in an imperfect substitute (Dierickx and Cool 1989).

A resource has low *substitutability* if there are few, if any, strategically equivalent resources that are, themselves, rare and inimitable (Amit and Schoemaker 1993; Black and Boal 1994; Collis and Montgomery 1995). Firms may find, for example, that excellence in IS product development, systems integration, or environmental scanning may be achieved through a number of equifinal paths.

Once a firm establishes a competitive advantage through the strategic use of resources, competitors will likely attempt to amass comparable resources in order to share in the advantage. A primary source of resources is factor (i.e., open) markets (Grant 1991). If firms are able to acquire the resources necessary to imitate a rival's competitive advantage, the rival's advantage will be short-lived. Thus, a requirement for sustained competitive advantage is that resources be *imperfectly mobile* or *non-tradable* (Amit and Schoemaker 1993; Barney 1991; Black and Boal 1994; Dierickx and Cool 1989).[7] Some resources are more easily bought and sold than others. Technological assets, for example, such as computer hardware and software, are relatively easy to acquire. Technical knowledge, managerial experience, and many skills and abilities are less easy to obtain. Other resources, such as company culture, brand assets, and so on, may only be available if the firm itself is sold (Grant 1991).

The preceding attributes—both *ex ante* and *ex post*—are summarized in Table 3. Conceptually, the two types of resource attributes are related. When a resource is imitated, more of that resource exists than before, and thus it becomes less rare. Resources that are highly mobile may be acquired by competing firms, again affecting the rarity of the resource *for that firm* (but not its overall rarity in the marketplace). Substitutability, by contrast, affects resource value, not rarity. Resources do not become less rare by having multiple substitutes; however, their value can be expected to diminish as substitute resources are developed. This conceptualization is shown in Figure 1.[8]

IS Resource Attributes

In this section, we use the resource attributes introduced above to describe the IS resources identified earlier in the paper. The relationships between these resources and their attributes are summarized in Table 4. The entries in this table should be interpreted in relative (i.e., versus other

[7] Resource mobility and tradability are closely related constructs. As Peteraf (1993, p. 183) notes, resources "are perfectly immobile if they cannot be traded." On the other hand, imperfectly mobile resources "are not commonly, easily, or readily exchanged on the market" (Capron and Hulland 1999, p. 42), even though they are tradable. Such barriers to mobility can arise as a result of switching costs (Montgomery and Wernerfelt 1988), resource co-specialization (Teece 1986), and/or high transactions costs (Rumelt 1987). We prefer use of the term *resource mobility* over *resource tradability* here because the former is a more finely grained construct than the latter.

[8] It is important to recognize that imitability and imperfect mobility or tradability are distinct resource attributes. The former prevents imitation by competitors of a firm's critical resources via direct copying or innovation. This can be due to causal ambiguity, lack of relevant resources on the part of the potential imitator, and time-competitive pressures (Braney 1991; Dierickx and Cool 1989). In contrast, imperfect mobility prevents the acquisition and transfer of key resources from one firm to another. Whereas resource imitability leads to an increase in the availability of a critical resource (thus undermining its rarity), resource mobility describes the degree to which an existing, fixed stock of a key resource can be transferred between firms. This distinction has been clearly recognized in previous RBV work (e.g., see Dierickx and Cool 1989; Dutta et al. 1999; Peteraf 1993).

Table 3. Resource Attributes

Resource Attribute	Terminology
***Ex ante* limits to competition**	
Value	Value (Barney 1991; Dierickx and Cool 1989)
Rarity	Rare (Barney 1991) Scarcity (Amit and Shoemaker 1993) Idiosyncratic assets (Williamson 1979)
Appropriability	Appropriability (Amit and Shoemaker 1993; Collis and Montgomery 1995; Grant 1991)
***Ex post* limits to competition**	
Imitability	Imperfect imitability: history dependent, causal ambiguity, social complexity (Barney 1991) Replicability (Grant 1991) Inimitability (Amit and Shoemaker 1993; Andrews 1971; Collis and Montgomery 1995) Uncertain imitability (Lippman and Rumelt 1982) Social Complexity (Fiol 1991) Causal ambiguity (Dierickx and Cool 1989)
Substitutability	Non-substitutability (Barney 1991) Transparency (Grant 1991) Substitutability (Collis and Montgomery 1995) Limited substitutability (Amit and Shoemaker 1993; Dierickx and Cool 1989) Substitutes (Black and Boal 1994)
Mobility	Imperfect mobility (Barney 1991) Transferability (Grant 1991) Low tradability (Amit and Shoemaker 1993; Dierickx and Cool 1989) Tradability (Black and Boal 1994)

Table 4. IS Resources, by Attribute

	Advantage Creation			Advantage Sustainability		
	Value	**Rarity**	**Appropriability**	**Imitability**	**Substitutability**	**Mobility**
Outside-In						
External relationship management	H	M – H	L – M	L	L – M	L
Market responsiveness	H	M – H	L – M	L	L – M	L
Spanning						
IS-business partnerships	H	M – H	L – M	L	L – M	L
IS management/ planning	H	M – H	L – M	L – M	L – M	M
Inside-Out						
IS infrastructure	M – H	L – M	H	H	L – M	H
IS technical skills	M – H	L – M	M	M	M – H	M – H
IS development	M – H	M	M	M	M – H	M
Cost efficient IS operations	M – H	L – M	M	L – M	M – H	M

Note: L = low; M = medium, H = high

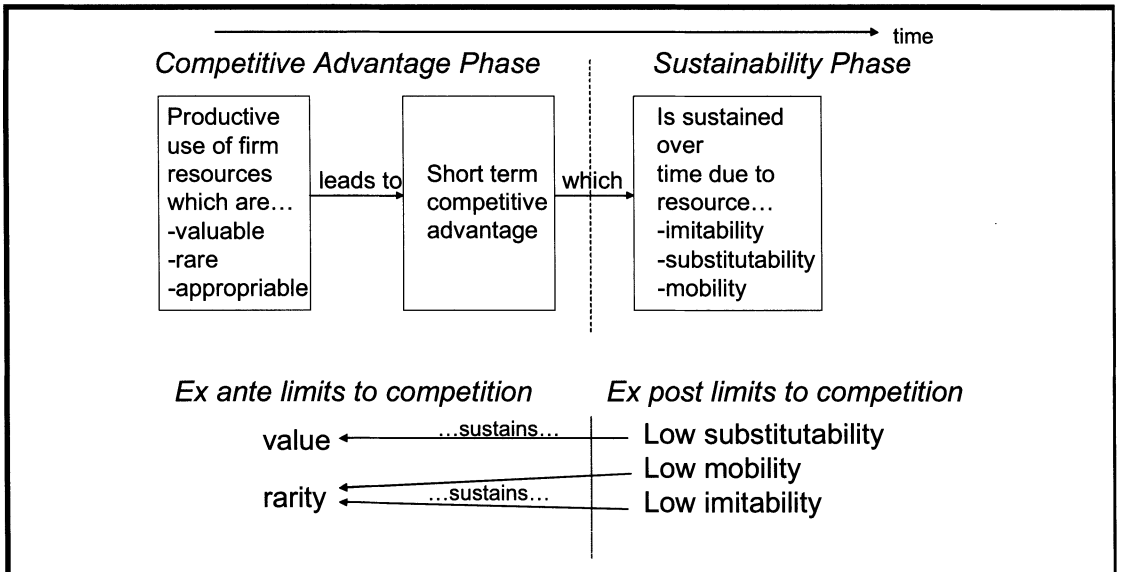

Figure 1. The Resource-Based View Over Time

entries in the same table) rather than absolute terms. We emphasize that this table is based on limited existing empirical evidence and therefore describes hypothesized rather than proven relationships.

Value

As noted earlier, all of the IS resources described here have at least moderate value to the firms that possess them. For example, the studies by Bharadwaj (2000), Feeny and Willcocks (1998), Lopes and Galletta (1997), and Marchand et al. (2000), Mata et al. (1995), and Ross et al. (1996) have all shown that IS resources have value to their firms (albeit not always realized). At the same time, outside-in and spanning resources seem to have potentially higher value than inside-out resources to firms. The reason for this is that the two former sets of resources—if valuable—must be based on a continued understanding of the changing business environment. While inside-out resources can lead to greater efficiency and/or effectiveness at any particular point in time, it is essential for the firm to track and respond to the changing business environment over time if it is to attain a sustainable competitive advantage.

Rarity

In general, the key IS resources described here are all likely to be relatively rare. However, as was the case for the value attribute, outside-in and spanning resources are likely to be associated with a higher degree of rarity than are inside-out resources. The underlying reason for this is that available labor markets allow firms lacking key IS technology, operational efficiency skills, and IS development personnel resources to acquire them by offering superior wages or through business arrangements with external consultants. Similarly, IS infrastructure can be acquired or copied relatively easily once it has been in existence even for a comparatively short period of time, although it may be very rare initially. In contrast, spanning and outside-in resources tend to be socially complex and cannot be easily acquired in factor markets, and must instead be developed through on-going, firm-specific investments or through mergers and/or acquisitions of other companies.

Appropriability

Although it is difficult to determine the exact degree of appropriability associated with each IS resource, a number of general observations seem warranted based on past research. First, IS infrastructure, technology skills, IS development, and cost efficiency may be appropriable, rent-generating resources in the short term, particularly when the firm possessing the IS resource has a first-mover advantage in its use, and competitors find such uses difficult to wrest away from the advantaged firm. For example, firms that are first to possess next-generation hardware and software are typically able to use this new infrastructure to improve firm efficiency and/or effectiveness, thereby enhancing short-term competitive advantage and rent-earning potential. Second, the appropriability of the outside-in and spanning resources tends to be lower than that of the inside-out resources. This stems from the fact that they tend to be organizationally complex, and thereby more difficult to deploy successfully.

Imitability

Over time, some IS resources become easier to imitate than others. The outside-in and spanning resources (particularly IS-business partnerships) are likely to be more difficult to imitate because both sets of resources will develop and evolve uniquely for each firm. Moreover, these resources are likely to be socially complex. In contrast, firms are likely to be able to develop technology skills and IS development capabilities through the hiring of relevant expertise via existing labor markets or by interacting with external consulting firms. Although less readily available, the IS management/planning and cost efficiency capabilities may also be available through such means. Thus, these latter resources will be more imitable than the outside-in and IS-business partnership resources, but less imitable than the technology

skills and IS development capability. Finally, existing empirical evidence suggests that IS infrastructure is particularly easy to imitate over moderate to longer time periods.

Substitutability

The key question that one needs to answer in considering substitutability is whether or not a strategically equivalent resource exists and is potentially available to the firm while leading to an equifinal outcome. This may involve the use of very different resource sets, but could also reflect a decision to acquire and deploy resources in-house versus obtaining them from third parties. In the case of IS infrastructure, it seems unlikely that strategic alternatives exist that lead to the same ultimate competitive position. Thus, the substitutability of this resource will be low. At the other extreme, firms may be able to outsource their IS development and other operations to third parties, and thereby compete effectively. Strategic substitutes for the outside-in and spanning resources are also likely to be rare, although it may be possible for firms with a subset of these capabilities (e.g., market responsiveness) to compete on an equal basis with firms possessing a different subset (e.g., IS-business partnerships).

Imperfect Mobility

This final resource attribute captures the extent to which the underlying resource can be acquired through factor markets. IS infrastructure, once established, is easily disseminated to other firms, and is thus highly mobile.[9] Technology skills, as well as the IS development, cost efficiency, and IS management/planning capabilities can all be acquired via the marketplace; thus, they are also relatively mobile. In contrast, the external relationship management, market responsiveness, and IS-business partnership capabilities are generally not readily available in factor markets. Therefore, the mobility of these latter three resources is expected to be low.

IS Resource Attribute Propositions

Two key implications emerge from the preceding discussion. First, it is important to recognize the fundamental difference that can exist between a resource's initial and longer-term impact on a firm's competitive position. Second, Table 4 suggests that both similarities and differences exist between distinct types of IS resources (cf. Santhanam and Hartono 2003). Each of these implications is examined in turn below.

Resource Creation Versus Sustainability

Although various studies have examined how IS resources can potentially create competitive advantage for firms, very little of this work has looked at sustaining that advantage over time. In fact, Kettinger et al. (1994) concluded that many of the success stories attributed to new IT configurations were only successful for a short period of time. Similarly, early arguments suggesting that a so-called first-mover advantage, if maintained, could lead to sustained advantage (e.g., Feeny and Ives 1990) were later challenged. In order to sustain a first-mover advantage, firms would need to become *perpetual innovators,* a role that may be untenable (Kettinger et al. 1994). More focus on the sustainability of IS resources is clearly warranted (Willcocks et al. 1997).[10]

[9]Note that this statement assumes that IS hardware is a discrete and separable part of the firm's overall IS resource set, and that it can be transferred from one firm to another with relative ease. However, as one reviewer noted, this may only be a recent phenomenon. Old, pre-ERP collections of legacy systems and databases were far more difficult to either imitate (due to organizational complexity; Barney 1991) or acquire (due to co-specialization; see Barney 2001; Teece 1986).

[10]Defining precisely what is meant by the term *sustainable* is trickier than it might first appear. Barney (1991, p. 102) clearly states that a sustained competitive advantage is one that "continues to exist after efforts to duplicate that advantage have ceased," and that this definition of SCA is equilibrium-based. However, as Wiggins and Ruefli (2002, p. 84) note, while Barney's definition is theoretically precise, it has proven to be

As we noted earlier, the *ex post* notions of resource imitability, substitutability, and mobility affect the *ex ante* notion of rarity. As resources are copied and traded, they become less rare (even when they maintain their value and appropriability). Because resource rarity is critical to the maintenance of longer-term competitive advantage, we predict the following:

Proposition 1: Only IS resources that are (1) inimitable, (2) non-substitutable, and (3) imperfectly mobile will have a positive effect on competitive position in the longer term.

Outside-In Versus Spanning Versus Inside-Out Resources

Proposition 1 is very general, and applies to both IS and non-IS resources. Our earlier review of IS resources suggests, however, that more specific predictions can be made for different types of resources. In particular, visual inspection of Table 4 suggests that outside-in and spanning resources tend to have similar resource attributes. In general, when compared to inside-out resources, they tend to have somewhat greater value, be rarer (but less appropriable), be more difficult to imitate or acquire through trade, and have fewer strategic substitutes. Focusing for a moment on the first two of these attributes, this suggests that firms possessing superior external relations, market responsiveness, IS-business partnership, and IS management/planning resources are likely to initially outperform competitors that rely more on resources that are internally focused (e.g., IS infrastructure, technology skills, IS development, and cost efficient operations).[11] Furthermore, because it is harder to imitate, acquire, or find strategic substitutes for the former set of resources than for the latter, outside-in and spanning resources are more likely to maintain their rarity, and thus support a sustainable competitive position for a longer period of time. Thus:

Proposition 2: Outside-in and spanning IS resources will have a stronger impact than inside-out IS resources on initial competitive position.

Proposition 3: Outside-in and spanning IS resources will have a more enduring impact than inside-out IS resources on long-term competitive position.

A disproportionate share of the existing work within IS looking at the link between IS resources and firm performance or competitive position has focused either primarily or exclusively on those resources that we have characterized above as inside-out resources. However, the preceding discussion suggests strongly that the key drivers of a *longer-term* competitive position are more likely to be the result of superior outside-in and spanning resources, whereas those resources that have received the greatest attention to date tend to be more transitory in their impact on performance. Thus, one key conclusion to be drawn from our review is that greater attention needs to be paid to all types of IS resources, and not just those that are internally focused (Straub and Watson 2001). This does not mean that resources such as IS infrastructure, technology skills, IS development, and cost efficiency should be ignored, but that their effects on competitive position and/or performance should be examined jointly with those of other, less inwardly focused IS (and non-IS) resources.

"virtually impossible to meaningfully operationalize quantitatively." Others (e.g., Jacobsen 1988; Porter 1985) have suggested that a sustained competitive advantage is a competitive advantage that endures for a longer period of calendar time. In this section, we adopt the latter perspective in order to develop empirically testable propositions. We discuss this point in more detail in the section on using the RBV in IS research.

[11]This initial period will typically be relatively short in duration (e.g., 6 months to 1 year), representing the time required for competitors to imitate or acquire the necessary resource(s). If these can be quickly attained or duplicated, then the short-term competitive advantage will prove to be fleeting, representing little more than a first-mover advantage.

Potential Moderators

The discussion thus far has assumed that IS resources *directly* affect the performance and/or competitive advantage of the firm. However, there is considerable and growing evidence to suggest that these effects may be more correctly viewed as both contingent and complementary. We begin this section by discussing the issue of resource complementarity in general, and then turn to an identification of key moderators that we believe can affect the IS resource-performance relationship.

Resource Complementarity

Conceptual and empirical development of the RBV as outlined above has resulted in a useful way to analyze the strategic value of resources. The further subdivision of resource attributes into those that help to create a competitive advantage and to sustain such an advantage once created helps to account for changes in performance over time. However, the RBV as currently conceived fails to adequately consider the fact that resources rarely act alone in creating or sustaining competitive advantage. This is particularly true of IS resources that, in almost all cases, act in conjunction with other firm resources to provide strategic benefits (Ravichandran and Lertwongsatien 2002). For example, Powell and Dent-Micallef (1997) concluded that the complementary use of IT and human resources lead to superior firm performance, and Benjamin and Levinson (1993) concluded that performance depends on how IT is integrated with organizational, technical, and business resources.

The issue of complementarity is an important one since it implies a more complex role for IS resources within the firm (Alavi and Leidner 2001; Henderson and Venkatraman 1993). In the same way that IT software is useless without IT hardware (and vice versa), IS resources play an interdependent role with other firm resources (Keen 1993; Walton 1989). Yet, the nature of this role is largely unknown. Kettinger et al. (1994) concede that IT-based success rests on the ability to "fit the pieces together" but offer little guidance on how this might happen. Jarvenpaa and Leidner (1998) note that IT can generate competitive value only if deployed so that it leverages preexisting business and human resources in the firm via co-presence or complementarity. Yet, the process by which IS resources interact with other firm resources is poorly understood, as is the nature of those resources (Ravichandran and Lertwongsatien 2002).

While recognized by various RBV theorists as important, the role of resource complementarity within the theory has not been extensively developed (Amit and Schoemaker 1993; Dierickx and Cool 1989; Teece 1986). Complementarity refers to how one resource may influence another, and how the relationship between them affects competitive position or performance (Teece 1986). Black and Boal (1994) note that resources can have one of three possible effects on one another: compensatory, enhancing, or suppressing/ destroying. A compensatory relationship exists when a change in the level of one resource is offset by a change in the level of another resource. An enhancing relationship exists when one resource magnifies the impact of another resource. A suppressing relationship exists when the presence of one resource diminishes the impact of another.

Although not based on resource theory, the strategic information technology (SIT) area of research is a rich source of evidence that can be used to illustrate the importance of the resource complementarity issue. In particular, a review of research in this area clearly demonstrates that possession of superior IS resources is not inevitably linked to enhanced performance. Since the 1950s, the influence of IT on organizations (Ackoff 1967; Argyris 1971; Dearden 1972; Gorry and Scott-Morton 1971; Keen 1981; Leavitt and Whisler 1958), both positive and negative, has been hotly debated. The study of information technology as a driver of competitive advantage began to take hold in the 1980s (e.g., Bakos and Treacy 1986; McFarlan 1984). A number of case studies in the mid- to late-1980s appeared to sup-

port the notion of information technology as a direct contributor of competitive advantage (e.g., Brady 1986; Copeland and McKenney 1988; Short and Ventaktaman 1992). However, more recent studies have challenged these conclusions by suggesting contingent effects of IT resources on performance (e.g., Carroll and Larkin 1992; Kettinger et al. 1994; Powell and Dent-Micallef 1997).

Table 5 summarizes the SIT empirical literature to date that relates IT to performance or competitive advantage. Two general conclusions can be drawn from this table. First, for those studies finding a direct relationship between IT and performance, the vast majority have reported a positive effect (e.g., Banker and Kauffman 1991; Mahmood 1993). In contrast, few studies have indicated null or negative effects (for exceptions, see Sager 1988; Venkatraman and Zaheer 1990; Warner 1987).

Second, a greater number of the SIT studies summarized in Table 5 have found a contingent effect of IT on performance than have found a direct effect. In some cases, SIT has been noted to have both a direct effect on performance as well as an interactive effect with other constructs. In other cases, only the interactive effects are significant, particularly over the longer term. From this, it seems clear that information systems infrequently contribute directly and solely to sustained firm performance. While information technology may be essential for firms to compete, it conveys no particular sustainable advantage to one firm over its rivals. This sentiment is consistent with the *strategic necessity hypothesis* proposed by Clemons and Row (1991).

While the SIT research stream is not based on resource-based logic, its conclusions helpfully inform the debate around resource complementarity. From the preceding discussion, it seems clear that there will be conditions under which specific IS resources must interact with other resources (IS and/or non-IS) if they are to confer competitive advantage on the firm, both in the immediate and longer terms. However, at present the relevant set of moderating constructs is not well established; we suggest that this needs to be a top priority of researchers interested in applying the RBV in an IS context. Indeed, at the moment three competing propositions can be articulated:

Proposition 4a: IS resources directly influence competitive position and performance.

Proposition 4b: IS resources influence competitive position and performance both directly and indirectly through interactions with other constructs (including other resources).

Proposition 4c: IS resources influence competitive position and performance only indirectly through interactions with other constructs (including other resources).

Although only one of these propositions can be correct, existing studies do not definitively support one over the other two. The SIT literature as well as a number of key resource-based studies within IS appear to lend support for proposition 4b, while researchers are increasingly skeptical of proposition 4a. The essential question that remains unanswered—and that deserves researcher attention—is whether proposition 4b or 4c is more correct. Clemons and Row (1991) have argued in favor of the latter, but the empirical findings to date do not consistently support this perspective. It is our belief that RBV theory can be useful in helping researchers to design future studies aimed at resolving this ongoing debate.

Potential Moderators

Moderators that have the potential to affect the relationship between key IS resources and performance can be separated into organizational factors (i.e., those that operate within the firm) and environmental factors (i.e., those that operate outside the firm's boundaries). Top management commitment has been identified as a moderating factor within the organization. Similarly, environ

Table 5. Summary of the Effects of Strategic Information Technology on Firm Performance

Outcome Effect	Relevant Studies
Direct and Positive Strategic information technology has a direct and positive effect on competitive advantage or performance	Banker and Kauffman (1991); Bharadwaj (2000); Clemons and Weber (1990); Floyd and Woolridge (1990); Jelassi and Figgon (1994); Mahmood (1993); Mahmood and Mann (1993); Mahmood and Soon (1991); Roberts et al. (1990); Silverman (1999); Tavakolion (1989); Tyran et al. (1992); Yoo and Choi (1990)
Direct and Negative Strategic information technology has a negative effect on competitive advantage or performance	Warner (1987)
No Effect Strategic information technology has no impact on competitive advantage or performance	Sager (1988); Venkatraman and Zaheer (1990)
Contingent Effect The effect of strategic information technology on competitive advantage or performance depends on other constructs	Banker and Kauffman (1988); Carroll and Larkin (1992); Clemons and Row (1988); Clemons and Row (1991); Copeland and McKenney (1988); Feeny and Ives (1990); Henderson and Sifonis (1988); Holland et al. (1992); Johnston and Carrico (1988); Kettinger et al. (1994); Kettinger et al. (1995); King et al. (1989); Lederer and Sethi (1988); Li and Ye (1999); Lindsey et al. (1990); Mann et al. (1991); Neo (1988); Powell and Dent-Micallef (1997); Reich and Benbasat (1990); Schwarzer (1995); Short and Venkatraman (1992)

mental turbulence, environmental munificence, and environmental complexity have been proposed as key moderating environmental factors. Each of these moderators is discussed in turn below.

Organizational Factors

Top Management Commitment to IS. This construct relates primarily to having commitment from top management for IS initiatives (Powell and Dent-Micallef 1997). In general, a top management team that promotes, supports, and guides the IS function is perceived to enhance the impact of IS resources on performance (Armstrong and Sambamurthy 1999; Ross et al. 1996). For example, Neo (1988) found that the use of strategic information technologies could lead to strategic advantage subject to management vision and support. When such support is lacking, IS resources will have little effect on competitive position or performance, even when substantial investments are made to acquire or develop such

resources. Conversely, strong top management support should facilitate a strong IS resource-performance link. Thus:

Proposition 5: Strong top management commitment to IS will interact with IS resources to positively affect performance.

Other Organizational Factors. Top management commitment has been clearly identified in the IS literature as affecting the relationship between IS resources and firm-level competitive advantage. However, there are other factors that may also moderate this relationship in specific contexts. For example, there is some evidence that organizational structure affects the role of IS resources within a firm (Fielder et al. 1996; Leifer 1988; Sambamurthy and Zmud 1999). Corporate culture, particularly as it relates to the level of innovation within a firm, has been shown to influence the effectiveness of information system adoption and use (Barley 1990; Orlikowski 1996). Other factors such as firm size, location, and industry may also influence how information systems resources affect firm performance and competitive advantage. The extent to which these or other factors play a role in the IS resource-firm performance relationship could become a subject of future research.

Environmental Factors

The relationship between IS resources and firm performance is affected not only by internal elements such as top management commitment and corporate culture, but also by environmental factors. These factors reflect the uncertainty in an organization's operating environment. Drawing on the work of Aldrich (1979), Child (1972), and Pfeffer and Salancik (1978), Dess and Beard (1984) concluded that three dimensions of the environment contribute most to environmental uncertainty and are thus most likely to consistently influence firm performance over time: environmental turbulence, munificence, and complexity.

Environmental Turbulence. In turbulent, fast changing environments, different assets and capabilities than those needed in more stable environments are required to achieve superior performance (Eisenhardt and Martin 2000; Teece et al. 1997; Volberda 1996). In a relatively stable business environment, the bulk of management's effort is put toward creating competitive advantage for the firm. Because the environment in this case changes slowly, any advantage achieved by a firm is likely to be sustained over an extended period of time (Miller and Shamsie 1996). By contrast, in a turbulent environment, many advantages are short-lived as competitive and environmental pressures quickly undermine any resource value or heterogeneity (Foss 1998). The ability to stay on top of business trends and to quickly respond to changing market needs is critical for superior firm performance in such environments.

Firms faced with more stable environments have a tendency to emphasize *static efficiency* at the expense of *dynamic efficiency* (Ghemawat and Costa 1993). Such firms prefer to exploit existing knowledge and capabilities rather than explore new possibilities (Leonard-Barton 1992; Levinthal and March 1993; Levitt and March 1988). In general, these will be inside-out (i.e., IT technology skills, IT development, cost efficiency, IS infrastructure) rather than outside-in or spanning resources. Thus, in more stable environments, inside-out resources will be emphasized and be a stronger determinant than outside-in or spanning resources of superior firm performance.

Proposition 6a: The relationship between inside-out resources and performance will be stronger for firms in stable business environments than for firms in turbulent business environments; but

Proposition 6b: The relationship between outside-in resources and performance will be stronger for firms in turbulent business environments than for firms in stable business environments; and

Proposition 6c: The relationship between spanning resources and performance will be stronger for firms in turbulent business environments than for firms in stable business environments.

Environmental Munificence. Environmental munificence refers to the extent to which a business environment can support sustained growth (Dess and Beard 1984). Environments that are mature or shrinking are normally characterized by low levels of munificence, whereas rapidly growing markets are typically associated with a high degree of munificence. When munificence is low, stiff competition often exists that can adversely affect the attainment of organizational goals, or even organizational survival (Toole 1994). In such environments, firms frequently strive to maintain profits by maximizing internal efficiencies. Inside-out IS resources such as cost effective IS operations play a key role in affecting competitive position in these cases by reducing costs and streamlining operations. In contrast, while outside-in and spanning IS resources can potentially support organizational goals by helping to monitor changes in the external environment to coordinate internal responses to such changes, the absence of munificence puts pressure on organizations to reduce investments in outside-in and spanning resources. Furthermore, since low munificence environments tend to be relatively mature, firms may be tempted to assume a static competitive picture and to focus more attention on inside-out capabilities that support improvements in firm efficiency.

Markets that are munificent tend to support organizational growth despite imperfect firm strategy. Such markets are relatively forgiving, with firms able to be competitive even when they do not possess superior resources. From this it follows that possession of superior inside-out capabilities will be substantially less critical when environmental munificence is high than when it is low. On the other hand, it is not clear how environmental munificence affects the relationships between both outside-in and spanning resources and a firm's competitive position. Thus, we only propose the following moderating effect for environmental munificence (although we believe that its effect on all three types of resources should be studied empirically):

Proposition 7: The relationship between inside-out resources and performance will be stronger for firms in low munificent environments than for firms in high munificent environments.

Environmental Complexity. Environmental complexity refers to the heterogeneity and range of an industry and/or an organization's activities (Child 1972). It can refer variously to the number of inputs and outputs required for an organization's operations, the number and types of suppliers, consumers and competitors that it interacts with, and so on. Complexity makes it more difficult for firms to both identify and understand the key drivers of performance. From the RBV perspective, such ambiguity makes it more difficult for competing firms to identify these critical resources for potential imitation, acquisition, or substitution. Thus, under conditions of high environmental complexity, the link between key resources and superior performance will tend to be stronger and more enduring.

This effect is likely to be important for all three types of resources. Organizations operating in highly complex environments must rely on efficient and effective systems to manage information and knowledge. When complexity is high, outside-in and spanning capabilities help the firm to absorb external information and coordinate its competitive responses, but inside-out IS capabilities will also be important. For example, a robust and flexible IS infrastructure coupled with strong IS technical skills may help a firm manage its operations more efficiently in the face of environmental complexity. Thus:

Proposition 8a: The relationship between inside-out resources and performance will be stronger for firms

in high complexity environments than for firms in low complexity environments; and

Proposition 8b: The relationship between outside-in resources and performance will be stronger for firms in high complexity environments than for firms in low complexity environments; and

Proposition 8c: The relationship between spanning resources and performance will be strong for firms in high complexity environments than for firms in low complexity environments.

Using the RBV in IS Research

We believe that application of the RBV to IS contexts has the potential to identify key drivers of superior business performance. At the same time, use of the RBV introduces new considerations that must be dealt with by researchers. In this section, we discuss three such considerations: choice of an appropriate level of resource specificity, choice of an outcome construct, and modifying the RBV framework over time by introducing dynamic elements into it.

Resource Specificity

How broadly or narrowly a resource is defined can have a substantial effect on its usefulness (Penrose 1959). However, on a practical basis, it is not always clear to researchers what level of specificity the problem requires. For example, a resource such as the "ability to program C++" is a good deal more precise that the "ability to develop software" or "IS technical skills." Examples of both broadly and narrowly defined resources exist in the IS literature. For example, in order to denote the ability to effective deal with outside parties, Bharadwaj et al. (1998) used one resource named *manage external linkages*, while Feeny and Willcocks (1998) made a finer distinction to include *contract facilitation*, *informed buying*, *vendor development*, and *contract monitoring* all as separate resources. A single resource is frequently used to denote the level of physical IT infrastructure within a firm (Bharadwaj et al. 1988; Ross et al. 1996). By contrast, Benjamin and Levinson (1993) divided IT infrastructure into two separate resources: *hard infrastructure* and *soft infrastructure*; and Lopes and Galletta (1997) further divided hard infrastructure into *storage and transmission assets* and *information processing capability*.

Broadly defined resources have the advantage of being readily generalized beyond a specific research situation, but can lose their explanatory value when applied to overly narrow or specific situations. Their utility comes at a more general level of abstraction. For example, Miller and Shamsie (1996) found that, in unstable environments, *property-based assets* such as physical infrastructure were less likely to positively affect financial performance than more specifically defined *knowledge-based assets* such as skills and know-how. Broad definitions explore what resource characteristics are important, and thus may be applicable across multiple resources and research settings. At the same time, however, reliance on a high level of abstraction may inappropriately combine distinct resources under a single label, thereby weakening the researcher's ability to uncover the true relationships that exist between IS resources and key outcomes.

Resources can also be defined narrowly. Typically, these studies define one or two resources in a particular context and explore the relationship between those resources and a relevant dependent variable. For example, Zaheer and Zaheer (1997) explored the link between alertness and responsiveness, and market influence in global currency markets. Others have used general resource categorizations at the conceptual level, but study-

specific operationalizations in the data collection stage (e.g., Henderson and Cockburn 1994; Powell and Dent-Micallef 1996). Studies of this type are useful within the limited scope of the research context, but there is often little *a priori* reason to expect that results from these studies can be generalized more broadly. In a study of the pharmaceutical industry, Silverman (1999) found that the RBV was validated with very narrow resource definitions. Narrow definitions help to fine-tune our understanding of specific resources and their effect on competitive position and performance in given settings. The dangers of using resources that are overly narrow in their definitions are twofold: any resultant findings are likely to be difficult to generalize to new contexts, and the list of potentially relevant resources can quickly become prohibitively lengthy for practical research use.

Most IS researchers making use of the RBV have tried to strike a balance between these two extremes (e.g., see Bharadwaj et al. 1998; Marchand et al. 2000; van der Heijden 2000). The appropriate level of resource specificity, in fact, will vary according to the objectives of the study. For research that examines specific technologies or specific industries, a set of more narrowly defined resources is appropriate. By contrast, wider and more inclusive definitions are more useful for research employing a wide scope. As a general rule, we recommend that researchers err on the side of generalizability. Narrow definitions of IS resources may suffer from reduced relevance as technologies, systems, and skills become obsolete over time. As tools to facilitate cross-disciplinary study and the development of a cumulative research tradition, narrow definitions are less effective than those that are more general and inclusive. Thus, programming skills or IS technical skills may be preferable as IS resources to Java programming skills or object-oriented programming skills. The resources described earlier in this paper are all mid-level constructs that are reasonably specific while also permitting an acceptable level of generalizability across studies.

Choice of an Outcome Construct

The dependent variable in IS research has been a point of significant debate in the field (e.g., Delone and McLean 1992; Seddon 1997). Many dependent variables are used in IS research, and it is often difficult to relate one set of findings to another. In contrast, IS work using the RBV has tended to be more focused, since the primary outcome of interest is sustained competitive advantage (SCA). As noted earlier, Barney (1991, p. 102) originally suggested that SCA "continues to exist after efforts to duplicate that advantage have ceased," a definition that assumes eventual equilibrium. However, more recently researchers have argued that in many industries long-run equilibria simply do not exist (e.g., Barney 2001; Dickson 1992; Hunt and Morgan 1995). Furthermore, SCA has proved to be very difficult to operationalize, and researchers employing the RBV have resorted to looking instead at related dependent constructs such as above-average performance in the long run (Porter 1985; Wiggins and Ruefli 2002).

Given the preceding discussion, we suggest that any dependent variable used in an RBV-based study needs to exhibit three key attributes: (1) it should provide an assessment of performance, (2) it should incorporate a competitive assessment element, and (3) it should address the notion of performance over time. Return on investment (ROI) and assets (ROA), sales, and market share are commonly used performance metrics in the strategic management literature (e.g., Bharadwaj 2000; Robins and Wiersema 1995). Yet, limiting RBV research to firm-level dependent variables may be overly restrictive, particularly in the case of IS resources that affect the firm at many levels. Firm performance is affected by a multitude of factors; thus, use of a single firm-level dependent variable may not capture this broader context (Ray et al. 2001). The strategic information technology research stream has found strong evidence for an indirect role for IT in firm performance. The basic logic is that IT affects other resources or processes which, in turn, lead to competitive advantage. Given this role, it is appropriate to

measure the effect IS resources have on other resources or processes. Therefore, IS researchers may find it particularly beneficial to use intermediate-level dependent variables at the business process, department, or project level (e.g., Ray et al. 2001).

Second, there should be some sense of comparativeness, assessing performance relative to that enjoyed by key competitors. Taken in isolation, a firm's performance, whether strong or weak, contains only limited meaning. For example, a firm may enjoy strong share growth, return on investment, and profit but actually lag key competitors on those measures. Conversely, traditional performance metrics may seem disappointing until compared to an industry average that is significantly worse. Unfortunately, to date this aspect of firm performance is the one that has been least emphasized by IS researchers using the RBV. Thus, we encourage researchers to take fuller advantage of competitive assessment tools when measuring firm performance so as to provide a richer and more complete account of how the firm's resources influence its competitive position.

Finally, any performance advantage must be sustained over time. On a practical level, this means that some effort must be made to track the dependent variable of interest over time to avoid drawing invalid conclusions about the durability and sustainability of firm resources, an important aspect of the resource-based view (Kettinger et al. 1994). There is little doubt that some competitive advantages endure for extended periods. For example, Wiggins and Ruefli (2002) estimated that between 2 and 5 percent of the firms they studied had enjoyed at least 10 years of competitive superiority. Some recent IS studies using the RBV have attempted to incorporate time elements into their design and analysis. For example, Bharadwaj (2000) tracked ROA and ROS over a 4 year period and Jarvenpaa and Leidner (1998) conducted interviews over a 2 year period. We suggest that this should be an important consideration for all future IS studies that make use of the RBV.

A key question that remains is when does a competitive advantage become long term or sustained? The logic of the RBV implies that a firm's competitive advantage will be sustained for as long as its resources are valuable and its competitors fail to acquire, imitate, or find substitutes for them. Beyond this central insight, the issue of the length of sustainability has been sidestepped by much of the mainstream RBV literature. There is a good reason for this. Length of sustainability is contingent on a wide variety of factors. Barney (1991) hints at some of these factors. Social complexity and causal ambiguity make it difficult for competitors to imitate resources as the exact process by which the competitive advantage is achieved is not always clear. Environmental turbulence and complexity may also affect the extent to which a competitive advantage is sustained. For example, Miller and Shamsie (1996) note that in times of relative stability an advantage may be sustained for a long period of time, but that during turbulent periods any advantages may be short-lived. Eisenhardt and Martin (2000) go even further, arguing that in very turbulent environments sustainability cannot be achieved without constant innovation.

When examining information technology-based strategic advantages, Hidding (2001) suggested that product or service type is a primary factor in determining how long an advantage can be sustained. Long cycle products, typically characterized by high consumer lock-in, may be able to sustain advantages for 7 to 10 years or more. Examples of long-cycle products include local phone services, airport hubs, and complex information technology products like operating systems. Inside-out IS capabilities like cost effective operations and IS infrastructure can support long cycle products by enhancing operating efficiencies. Standard cycle products, characterized by high-volumes and low-margins, are able to sustain advantages for 4 to 6 years. Standard-cycle products can be supported by all of the IS resources. Short-cycle products, with very short production cycles, are able to sustain advantages for less than 3 years. Examples of short-cycle products include microprocessors and many

information products. By supporting organizational change and renewal, outside-in and spanning capabilities are able to support short cycle products.

Information systems resources such as those described earlier in this review can be employed by firms of any size, in any industry, producing any type of product or service. Thus, too many contingencies exist to generalize about how long a competitive advantage may last. It is merely possible to state that IS resources can support—at least potentially—both short-term and long-term advantages.

Dynamic Resources

A growing body of literature seeks to more formally incorporate the competitive environment into resource-based thinking. One focus of this research has been on the distinction between stable and dynamic environments. Some resources are more useful to the firm in relatively stable environments while others are more useful in dynamic, unstable, or volatile environments (Miller and Shamsie 1996). The former have been dubbed core resources, while the latter have been called dynamic resources (Eisenhardt and Martin 2000; Teece et al. 1997).

The distinction between these two resource types represents an extension of the traditional static RBV conceptualization. The resource-based view has been criticized for ignoring factors surrounding resources, instead assuming that they simply exist (Stinchcombe 2000). Considerations such as how resources are developed, how they are integrated within the firm, and how they are released have been under-explored in the literature. The mechanisms underlying how exactly key resources benefit the firm are also poorly specified in the RBV. The concept of dynamic resources attempts to bridge these gaps by adopting a process approach: by acting as a buffer between core resources and the changing business environment, dynamic resources help a firm adjust its resource mix and thereby maintain the sustainability of the firm's competitive advantage, which otherwise might be quickly eroded (Eisenhardt and Martin 2000; Teece et al. 1997; Volberba 1996).

Although IS researchers using the RBV have not typically looked at dynamic resources, a study by Jarvenpaa and Leidner (1998) suggests that IS resources may take on many of the attributes of dynamic resources, and thus may be particularly useful to firms operating in rapidly changing environments. Thus, even if IS resources do not directly lead the firm to a position of superior SCA, they may nonetheless be critical to the firm's longer-term competitiveness in unstable environments if they help it to develop, add, integrate, and release other key resources over time. The dynamic resources perspective provides an avenue for renewed relevance of IS resources beyond their traditional interpretation within the context of the RBV. This suggests that IS studies of resources (both IS and non-IS) will be particularly informative when conducted in highly turbulent business environments.

Summary and Conclusions

The resource-based view of the firm is a robust theory that has received wide acceptance in other management fields. While it has been used on a number of occasions in IS research, there has been no comprehensive effort to describe or defend its use in an IS context. The purpose of this paper has been to provide an overview of the RBV for those who wish to understand and use the theory in IS research.

The resource-based view of the firm is a useful tool for researchers to understand if, and how, particular parts of the firm affect the firm at large. Many parts have been extensively researched. For example, brands, patents, product development practices, knowledge management capabilities, and the like have been extensively researched in the management disciplines. Other parts are less well understood. As we have suggested here, the RBV provides a way for IS

researchers to understand the role of information system within the firm. Once the role of IS resources has been explored and defined, it can be compared on equal terms with the roles played by other firm resources to eventually form an integrated understanding of long-term firm competitiveness.

The resource-based view makes a useful distinction between information technology and information systems. The former is asset-based, while the latter comprises a mixture of assets and capabilities formed around the productive use of information technology. It is our contention that the RBV, through its focus on attributes and its recognition of the importance of resource complementarity, will uncover an enhanced role for information systems in sustained firm competitiveness. And it is our hope that the discussions, issues, and ideas set forth in the paper will stimulate interest and research incorporating the RBV in the field of information systems.

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References

Ainuddin, R. A. *Resource Attributes and Joint Venture Performance in Malaysia,* Unpublished Ph.D. Dissertation, University of Western Ontario, 2000.

Ackoff, R. "Management Misinformation Systems," *Management Science* (14:4), 1967, pp. 147-156.

Alavi, A., and Leidner, D. "Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly* (25:1), 2001, pp. 107-136.

Alchian, A. A. "Uncertainty, Evolution, and Economic Theory," *American Economic Review* (58), 1950, pp. 388-401.

Aldrich, H. E. *Organizations and Environments,* Prentice Hall, Englewood Cliffs, NJ, 1979.

Amit, R., and Schoemaker, P. J. H. "Strategic Assets and Organizational Rent," *Strategic Management Journal* (14), 1993, pp. 33-46.

Andreu, R., and Ciborra, C. "Organizational Learning and Core Capabilities Development: the Role of IT," *The Journal of Strategic Information Systems* (5:2), 1996, pp. 111-127.

Andrews, K. *The Concept of Corporate Strategy*, Dow Jones-Irwin, Homewood, IL, 1971.

Argyris, C. "Management Information Systems: the Challenge to Rationality and Emotionality," *Management Science* (17:6), 1971, pp. B-275-B292.

Armstrong, C. P., and Sambamurthy, V. "Information Technology Assimilation in Firms: The Influence of Senior Leadership and IT Infrastructures," *Information Systems Research* (10:4), 1999, pp. 304-327.

Bakos, J. Y., and Treacy, M. E. "Information Technology and Corporate Strategy: A Research Perspective," *MIS Quarterly* (10:2), 1986, pp. 107-120.

Banker, R., and Kauffman, R. J. "Strategic Contributions of Information Technology: An Empirical Study of ATM Networks," in *Proceedings of the Ninth International Conference on Information Systems,* J. I. DeGross and M. H. Olson (eds.), Minneapolis, MN, 1988, pp. 141-150.

Banker, R., and Kauffman, R. J. "Reuse and Productivity in Integrated Computer-Aided Software Engineering: An Empirical Study," *MIS Quarterly* (15:3), 1991, pp. 374-401.

Barley, S. R. "The Alignment of Technology and Structure through Rroles and Networks," *Administrative Science Quarterly* (35), 1990, pp. 61-103.

Barney, J. B. "Types of Competition and the Theory of Strategy: Toward an Integrative Framework," *Academy of Management Review* (11), 1986, pp. 791-800.

Barney, J. "Firm Resources and Sustained Competitive Advantage," *Journal of Management* (17:1), 1991, pp. 99-120.

Barney, J. "Is the Resource-based "View" a Useful Perspective for Strategic Management Research? Yes," *Academy of Management Review* (26:1), 2001, pp. 41-56.

Benjamin, R. I., and Levinson, E. "A Framework for Managing IT-Enabled Change," *Sloan Management Review* (Summer), 1993, pp. 23-33.

Bharadwaj, A. S. "A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation," *MIS Quarterly* (24:1), 2000, pp. 169-196.

Bharadwaj, A. S., Sambamurthy, V., and Zmud, R. W. "IT Capabilities: Theoretical Perspectives and Empirical Operationalization," in *Proceedings of the 19th International Conference on Information Systems*, R. Hirschheim, M. Newman, and J. I. DeGross (eds.), Helsinki, Finland, 1998, pp. 378-385.

Black, J. A., and Boal, K. B. "Strategic Resources: Traits, Configurations and Paths to Sustainable Competitive Advantage," *Strategic Management Journal* (15), 1994, pp. 131-148.

Brady, R. "The Strategic Use of Information: Seizing the Competitive Edge," *Information Week*, May 26 1986, pp. 26-62.

Broadbent, M., Weill, P and Neo B. S. "Strategic Context and Patterns of IT Infrastructure Capability," *Journal of Strategic Information Systems* (8:2), 1999, pp. 157-187.

Butler, B. S. "Membership Size, Communication Activity, Sustainability: A Resource-Based Model of Online Social Structures," *Information Systems Research* (12:4), 2001, pp. 346-362.

Byrd, T. A. "Technology, Core Competencies, and Sustained Competitive Advantage," *Information Resources Management Journal* (14:2), 2001, pp. 41-52.

Capron, L., and Hulland, J. "Redeployment of Brands, Sales Forces, and General Marketing Management Expertise Following Horizontal Acquisitions: A Resource-Based View," *Journal of Marketing* (63:April), 1999, pp. 41-54.

Carroll, C., and Larkin, C. "Executive Information Technology: A Strategic Necessity at Motorola Codex," *Information Systems Management* (9:3), 1992, pp. 21-29.

Chan, Y. E., Huff, S. L., Barclay, D. W., and Copeland, D. G. "Business Strategic Orientation, Information Systems Strategic Orientation, and Strategic Alignment," *Information Systems Research* (8:2), 1997, pp. 125-147.

Child, J. "Organizational Structure, Environment and Performance: The Role of Strategic Choice," *Sociology* (1), 1972, pp. 2-22.

Christensen, C. M., and Overdorf, M. "Meeting the Challenge of Disruptive Change," *Harvard Business Review* (78:2), 2000, pp. 67-75.

Christianse, E., and Venkatraman, N. "Beyond Sabre: An Empirical Test of Expertise Exploitation in Electronic Channels," *MIS Quarterly* (26:1), 2002.

Clemons, E., and Row, M. "Cash Management Accounts: A Case Study in Strategic Information Systems," *Proceedings of the 21st Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Los Alamitos, CA, 1988, pp. 131-140.

Clemons, E. K., and Row, M. C. "Sustaining IT Advantage: The Role of Structural Differences," *MIS Quarterly* (15:3), 1991, pp. 275-292.

Clemons, E., and Weber, B. "London's Big Bang: A Case Study of Information Technology, Competitive Impact, and Organizational Change," *Journal of Management Information Systems* (6:4), 1990, pp. 41-60.

Collis, D. J., and Montgomery, C. A. "Competing on Resources: Strategy in the 1990s," *Harvard Business Review* (73:4), 1995, pp. 118-128.

Cool, K., and Schendel, D. "Performance Differences Among Strategic Group Members," *Strategic Management Journal* (9), May-June 1988, pp. 207-233.

Copeland, D., and McKenney, J. "Airline Reservation Systems: Lessons From History," *MIS Quarterly* (12:3), September 1988, pp. 353-370.

Day, G. "The Capabilities of Market-Driven Organizations," *Journal of Marketing* (58:4), 1994, pp. 37-52.

Dearden, J. "MIS is a Mirage," *Harvard Business Review* (50:1), 1972, pp. 111-120.

DeLone, W. H., and McLean, E. R. "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research* (3:1), 1992, pp. 60-95.

Dess, G., and Beard, D. "Dimensions of Organizational Task Environments," *Administrative Science Quarterly* (29), 1984, pp. 52-73.

Dickson, P. R. "Toward a General Theory of Competitive Rationality," *Journal of Marketing* (56:1), 1992, pp. 69-83.

Dierickx, I., and Cool, K. "Asset Stock Accumulation and Sustainability of Competitive Advantage," *Management Science* (35), 1989, pp. 1504-1511.

Dutta, S, Narasimhan, O., and Rajiv, S. "Success in High-Technology Markets: Is Marketing Capability Critical?," *Marketing Science* (18:4), 1999, pp.547-568.

Eisenhardt, K., and Martin, J. "Dynamic Capabilities: What Are They?," *Strategic Management Journal* (21), 2000, pp. 1105-1121.

Fahy, J., and Smithee, A. "Strategic Marketing and the Resource-Based View of the Firm," *Academy of Marketing Science Review* (99:10), 1999, pp. 1-21.

Feeny, D. F., and Ives, B. "In Search of Sustainability: Reaping Long-Term Advantage from Investments in Information Technology," *Journal of Management Information Systems* (7:1), 1990, pp. 27-46.

Feeny, D. F., and Willcocks, L. P. "Core IS Capabilities for Exploiting Information Technology," *Sloan Management Review* (39:3), 1998, pp. 9-21.

Fielder, K., Grover, V., and Teng, J. "An Empirical Study of Information Technology Enabled Business Process Redesign and Corporate Competitive Strategy," *European Journal of Information Systems* (4), 1995, pp. 17 -30.

Fiol, C. M. "Managing Culture as a Competitive Resource: An Identity-Based View of Competitive Advantage," *Journal of Management* (17:1), 1991, pp. 191-211.

Floyd, S. W., and Woolridge, B. "Path Analysis of the Relationship between Competitive Strategy, Information Technology, and Financial Performance," *Journal of Management Information Systems* (7:1), 1990, pp. 47-64.

Foss, N. J. "The Resource-Based Perspective: An Assessment and Diagnosis of Problems," Working Paper, Department of Industrial Economics and Strategy, Copenhagen Business School, 1998.

Ghemawat, P., and Costa, J. E. "The Organizational Tension between Static and Dynamic Efficiency," *Strategic Management Journal* (14), 1993, pp. 59-73.

Gorry, A., and Scott-Morton, M. "A Framework for Information Systems," *Sloan Management Review* (13:Fall), 1971, pp. 56-79.

Grant, R. M. "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation," *California Management Review* (33:1), 1991, pp. 114-135.

Hall, R. *Complex Systems, Complex Learning, and Competence Building*, Wiley, New York, 1997.

Hambrick, D. "Top Management Teams: Key to Strategic Success," *California Management Review* (30), 1987, pp. 88-108.

Hansen, G., and Wernerfelt, B. "Determinants of Firm Performance: The Relative Importance of Economic and Organizational Factors," *Strategic Management Journal* (10), 1989, pp. 399-411.

Henderson, J. C., and Sifonis, J. G. "The Value of IS Planning: Understanding Consistency, Validity, and IS Markets," *MIS Quarterly* (12:2), 1988, pp. 186-200.

Henderson, J. C., and Venkatraman, N. "Strategic Alignment: Leveraging Information Technology for Transforming Organizations," *IBM Systems Journal* (32), 1993, pp. 4-16.

Henderson, R., and Cockburn, I. "Measuring Competence? Exploring Firm Effects in Pharmaceutical Research," *Strategic Management Journal* (15), 1994, pp. 63-84.

Hidding, G. "Sustaining Strategic IT Advantage in the Information Age: How Strategy Paradigms Differ by Speed," *Journal of Strategic Information Systems* (10: September), 2001, pp. 201-222.

Hirshliefer, J. *Price Theory and Applications*, Prentice-Hall, Englewood Cliffs, NJ, 1980.

Holland, C., Lockett, G., and Blackman, I. "Planning for Electronic Data Interchange," *Strategic Management Journal* (13), 1992, pp. 539-550.

Hunt, S. D., and Morgan, R. M. "The Comparative Advantage Theory of Competition," *Journal of Marketing* (59: 2), 1995, pp. 1-15.

Itami, H., and Roehl, T. *Mobilizing Invisible Assets*, Harvard University Press, Cambridge, MA, 1987.

Jacobsen, R. "The Persistence of Abnormal Returns," *Strategic Management Journal* (9), 1988, pp. 41-58.

Jarvenpaa, S. L., and Leidner, D. E. "An Information Company in Mexico: Extending the Resource-Based View of the Firm to a Developing Country Context," *Information Systems Research* (9:4), 1998, pp. 342-361.

Jelassi, T., and Figon, O. "Competing Through EDI at Brun Passot: Achievements in France and Ambitions for the Single European Market," *MIS Quarterly* (18:4), 1994, pp. 337-352.

Johnston, H. R., and Carrico, S. R. "Developing Capabilities to Use Information Strategically," *MIS Quarterly* (12:1), 1988, pp. 36-48.

Keen, P. G. W. "Information Systems and Organizational Change," *Communications of the ACM* (24:1), 1981, pp. 24-32.

Keen, P. G. W. "Information Technology and the Management Difference: A Fusion Map," *IBM Systems Journal* (32), 1993, pp. 17-39.

Kettinger, W., Grover, V., Guha, S., and Segars, A. "Strategic Information Systems Revisited: A Study in Sustainability and Performance," *MIS Quarterly* (18:1), 1994, pp. 31-58.

Kettinger, W., Grover, V., and Segars, A. "Do Strategic Systems Really Pay Off?," *Information Systems Management* (12:1), 1995, pp. 35-43.

King, W., Grover, V., and Hufnagel, E. "Using Information and Information Technology for Sustainable Competitive Advantage: Some Empirical Evidence," *Information and Management* (17), 1989, pp. 87-93.

Klein, B., and Lefler, K. "The Role of Price in Guaranteeing Quality," *Journal of Political Economy* (89), 1981, pp. 615-641.

Kohli, A. K., and Jaworski, B. J. "Market Orientation: The Construct, Research Propositions, and Managerial Implications," *Journal of Marketing* (54), April 1990, pp. 1-18.

Leavitt, H., and Whisler, T. "Management in the 1980s," *Harvard Business Review* (36:6), 1958, pp. 41-48.

Lederer, A., and Sethi, V. "The Implementation of Strategic Information Systems Planning Methodologies," *MIS Quarterly* (12:3), 1988, pp. 445-461.

Liefer, R. "Matching Computer-Based Information Systems with Organizational Structures", *MIS Quarterly* (12:1), 1988, pp. 63-73.

Leonard-Barton, D. "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development," *Strategic Management Journal* (13), Summer 1992, pp. 111-129.

Levinthal, D. A., and March, J. G. "The Myopia of Learning," *Strategic Management Journal* (14), 1993, pp. 95-112.

Levitt, B., and March, J. G. "Organizational Learning," *Annual Review of Sociology* (14), 1988, pp. 319-340.

Li, M., and Ye, L. R. "Information Technology and Firm Performance: Linking with Environmental, Strategic and Managerial Contexts," *Information & Management* (35:1), 1999, pp. 3-51.

Lindsey, D., Cheney, P., Kasper, G., and Ives, B. "TELCOT: An Application of Information Technology for Competitive Advantage in the Cotton Industry," *MIS Quarterly* (14:4), 1990, pp. 346-357.

Lippman, S., and Rumelt, R. "Uncertain Imitability: An Analysis of Interfirm Differences in Efficiency Under Competition," *Bell Journal of Economics* (13), 1982, pp. 418-438.

Lopes, A. B., and Galletta, D. "Resource-Based Theory and a Structural Perspective of Strategy Applied to the Provision of Internet Services," in *Proceedings of the Third Americas Conference on Information Systems*, Indianapolis, IN, 1997.

Mahmood, M. "Associating Organizational Strategic Performance with Information Technology: An Exploratory Research," *European Journal of Information Systems* (2:3), 1993, pp. 185-200.

Mahmood, M., and Mann, G. "Measuring the Organizational Impact of Information Technology Investment: An Exploratory Study," *Journal of Information Systems* (10), 1993, pp. 97-122.

Mahmood, M., and Soon, S. K. "A Comprehensive Model for Measuring the Potential Impact of Information Technology on Organizational

Strategic Variables," *Decision Sciences* (22:4), 1991, pp. 869-897.

Mahoney, J. T., and Pandian, R. "The Resource-Based View Within the Conversation of Strategic Management," *Strategic Management Journal* (13), 1992, pp. 363-380.

Makadok, R. "Toward a Synthesis of the Resource-Based and Dynamic-Capability Views of Rent Creation," *Strategic Management Journal* (22), 2001, pp. 387-401.

Mann, M., Rudman, R., Jenckes, T., and McNurlin, B. "EPRINET: Leveraging Knowledge in the Electric Utility Industry," *MIS Quarterly* (15:3), 1991, pp. 402-421.

Marchand, D. A., Kettinger, W. J., and Rollins, J. D. "Information Orientation: People, Technology and the Bottom Line," *Sloan Management Review* (41:4), 2000, pp. 69-80.

Mata, F. J., Fuerst, W. L., and Barney, J. B. "Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis," *MIS Quarterly* (19:4), 1995, pp. 487-505.

McFarlan, F. W. "Information Technology Changes the Way You Compete," *Harvard Business Review* (62:3), 1984, pp. 98-105.

McGrath, R. G., MacMillan, I. C., and Venkataraman, S. "Defining and Developing Competence: A Strategic Process Paradigm," *Strategic Management Journal* (16), 1995, pp. 251-275.

Miller, D., and Shamsie, J. "The Resource-Based View of the Firm in Two Environments: The Hollywood Firm Studios from 1936-1965," *Academy of Management Journal* (39:3), 1996, pp. 519-543.

Montgomery, C. A., and Wernerfelt, B. "Diversification, Ricardian Rents, and Tobin's Q," *Rand Journal* (19:4), 1988, pp. 623-632.

Neo, B. S. "Factors Facilitating the Use of Information Technology for Competitive Advantage: An Exploratory Study," *Information and Management* (15), 1988, pp. 191-201.

Orlikowski, W. "Improvising Organizational Transformation Over Time: A Situated Change Perspective," *Information Systems Research* (7:1), 1996, pp. 63-92.

Penrose, E. T. *The Theory of the Growth of the Firm*, Wiley, New York, 1959.

Periera, R. E. "Resource View Theory Analysis of SAP as a Source of Competitive Advantage for Firms," *The DATA BASE for Advances in Information Systems* (30:1), 1999, pp. 38-46.

Peteraf, M. A. "The Cornerstones of Competitive Advantage: A Resource-Based View," *Strategic Management Journal* (14), 1993, pp. 179-191.

Pfeffer, J., and Salancik, G. *The External Control of Organizations: A Resource Dependence Perspective,* Harper and Row, New York, 1978.

Piccoli, G., Feeny, D., and Ives, B. "Creating and Sustaining IT-Enabled Competitive Advantage," in *Competing in the Information Age: Strategic Alignment in Practice*, J. Luftman (ed.), Oxford University Press, Oxford, 2002, pp. 107-136.

Poppo, L., and Zenger, T. "Testing Alternative Theories of the Firm: Transaction Cost, Knowledge-Based, and Measurement Explanations for Make-or-Buy Decisions in Information Services," *Strategic Management Journal* (19), 1998, pp. 853-877.

Porter, M. *Competitive Advantage*, The Free Press, New York, 1985.

Powell, T. C., and Dent-Micallef, A. "Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources," *Strategic Management Journal* (18:5), 1997, pp. 375-405.

Prahalad, C. K., and Hamel, G. "The Core Competence of the Corporation," *Harvard Business Review* (68:3), 1990, pp. 79-92.

Priem, R. L., and Butler, J. E. "Is the Resource-Based 'View' a Useful Perspective for Strategic Management Research?," *Academy of Management Review* (26:1), 2001a, pp. 22-40.

Priem, R. L., and Butler, J. E. "Tautology in the Resource-Based View and the Implications of Externally Determined Resource Value: Further Comments," *Academy of Management Review* (26:1), 2001b, pp. 57-66.

Ravichandran, T., and Lertwongsatien, C. "Impact of Information Systems Rresources and Capabilities on Firm Performance: A Resource-Based Perspective," *Proceedings of 23rd International Conference on Information Systems,*, L. Applegate, R. Galliers, and J. I. DeGross (eds.), Barcelona, Spain, 2002, pp. 577-582.

Ray, G., Barney, J. B., and Muhanna, W. A. "Capabilities, Business Processes, and Competitive Advantage: The Impact of Information Technology on Customer Satisfaction in North American Insurance Industry," Working Paper, University of Texas at Austin, 2001.

Ray, G., Muhanna, W. A., and Barney, J. B. "Information Technology and Competitive Advantage: A Process-Oriented Assessment," Working Paper, University of Texas at Austin, 2001.

Reed, R., and DeFillippi, R. J. "Causal Ambiguity, Barriers to Imitation, and Sustainable Competitive Advantage," *Academy of Management Review* (15:1), 1990, pp. 88-102.

Reich, B. H., and Benbasat, I. "An Empirical Investigation of Customer-Oriented Strategic Systems," *Information Systems Research* (1:3), 1990, pp. 325-347.

Reich, B. H., and Benbasat, I. "Measuring the Linkage between and Information Technology Objectives," *MIS Quarterly* (20:1), 1996, pp. 55-81.

Ricardo, D. *Economic Essays*, A. M. Kelley Books, New York, 1966.

Roberts, L., Brown, D., and Pirani, M. "Information Strategies: Motor Dealerships and the Porter Thesis," *Management Decision* (28:7), 1990, pp. 22-25.

Robins, J., and Wiersema, M. F. "A Resource-Based Approach to the Multibusiness Firm: Empirical Analysis of Portfolio Interrelationships and Corporate Financial Performance," *Strategic Management Journal* (16), 1995, pp. 277-299.

Ross, J. W., Beath, C. M., and Goodhue, D. L. "Develop Long-term Competitiveness Through IT Assets," *Sloan Management Review* (38:1), 1996, pp. 31-42.

Rumelt, R. P. "Theory, Strategy, and Entrepreneurship," in *The Competitive Challenge*, D. Teece (ed.), Ballinger, Cambridge, MA, 1987, pp. 137-158.

Sager, M. "Competitive Information Systems in Australian Retail Banking," *Information and Management* (15), 1988, pp. 59-67.

Sambamurthy, V., and Zmud, R. "Arrangements for Information Technology Governance: A Theory of Multiple Contingencies," *MIS Quarterly* (23:2), 1999, pp. 261-290.

Sanchez, R., Heene, A., and Thomas, H. *Introduction: Towards the Theory and Practice of Competence-Based Competition*, Pergamon Press, Oxford, 1996.

Santhanam, R., and Hartono, E. "Issues in Linking Information Technology Capability to Firm Performance," *MIS Quarterly* (27:1), 2003, pp. 125-153.

Schoemaker, P., and Amit, R. "Investment in Strategic Assets: Industry and Firm Level Perspectives," in *Advances in Strategic Management (10A): Resource-Based View of the Firm),* P. Shrivastava, A. S. Huff, and J. E. Dutton (eds.), JAI Press, Greenwich, CT, 1994, pp. 3-33.

Schwarzer, B. "Organizing Global IS Management to Meet Competitive Challenges: Experiences from the Pharmaceutical Industry," *Journal of Global Information Management* (3), 1995, pp. 5-16.

Seddon, P. "A Respecification and Extension of the DeLone and McLean Model of IS Success," *Information Systems Research* (8:3), 1997, pp. 240-253.

Service, R. W., and Maddux, H. S. "Building Competitive Advantage Through Information Systems: The Organizational Information Quotient," *Journal of Information Science* (25:1), 1999, pp. 51-65.

Short, J., and Venkatraman, N. "Beyond Business Process Redesign: Redefining Baxter's Business Network," *Sloan Management Review* (34:1), 1992, pp. 7-20.

Silverman, B. S. "Technological Resources and the Direction of Corporate Diversification: Toward an Integration of the Resource-Based View and Transaction Cost Economics," *Management Science* (45:8), 1999, pp. 1109-1124.

Srivastava, R. K., Shervani, T. A., and Fahey, L. "Market-Based Assets and Shareholder Value: A Framework for Analysis," *Journal of Marketing* (62), January 1998, pp. 2-18.

Stinchcombe, A. L. "Social Structure and Organizations: A Comment," in *Economics Meets Sociology in Strategic Management: Advances in Strategic Management*, J. Baum and F. Dobbins (eds.), JAI Press, Greenwich, CT, 2000.

Straub, D., and Watson, R. "Transformational Issues in Researching IS and Net-Enabled Organizations," *Information Systems Research* (12:4), 2001, pp. 337-345.

Tavakolian, H. "Linking the Information Technology Structure with Organizational Competitive Advantage: A Survey," *MIS Quarterly* (13:3), 1989, pp. 309-317.

Teece, D. J. "Firm Boundaries, Technological Innovation and Strategic Planning," in *The Economics of Strategic Planning*, G. L. Thomas (ed.), D. C. Heath, Lexington, MA, 1986, pp. 187-199.

Teece, D. J., Pisano, G., and Shuen, A. "Dynamic Capabilities and Strategic Management," *Strategic Management Journal* (18:7), 1997, pp. 509-533.

Toole, T. M. *Task and Environmental Uncertainty and the Adoption of Technological Innovations by Home Builders*, Unpublished Ph.D. Dissertation, Massachusetts Institute of Technology, 1994.

Tyran, C., Dennis, A., Vogel, D., and Nunamaker, J. "The Application of Electronic Meeting Technology to Support Strategic Management," *MIS Quarterly* (16:3), 1992, pp. 313-334.

Van der Heijden, H. "Measuring IT Core Capabilities for Electronic Commerce: Results from a Confirmatory Factor Analysis," in *Proceedings of the 21st International Conference on Information Systems*, W.J. Orlikowski, S. Ang, P. Weill, H. C. Krcmar, and J. I. DeGross (eds.), Brisbane, Australia, 2000, pp. 152-163.

Venkatraman, N., and Zaheer, A. "Electronic Integration and Strategic Advantage: Quasi-Experimental Study in the Insurance Industry," *Information Systems Research* (1:4), 1990, pp. 377-393.

Volberda, H. W. "Toward the Flexible Firm: How to Remain Vital in Hypercompetitive Environments," *Organization Science* (7:4), 1996, pp. 359-374.

Wade M., and Gravill, J. "Diversification and Performance of Japanese IT Subsidiaries: A Resource-Based View," *Information and Management* (40:4), 2003, pp. 305-316.

Walton, R. *Up and Running: Integrating Information Technology and the Organization*, Harvard Business School Press, Cambridge, MA, 1989.

Warner, T. N. "Information Technology as a Competitive Burden," *Sloan Management Review* (29:1), 1987, pp. 55-61.

Wernerfelt, B. "A Resource-Based View of the Firm," *Strategic Management Journal* (5), 1984, pp. 171-180.

Wiggins, R. R., and Ruefli, T. W. "Sustained Competitive Advantage: Temporal Dynamics and the Incidence and Persistence of Superior Economic Performance," *Organization Science* (13:1), 2002, pp. 82-105.

Willcocks, L. P., Feeny, D. F., and Islei, G. *Managing IT as a Strategic Resource*, McGraw-Hill, Maidenhead, UK, 1997.

Williamson, O. E. "Transaction Cost Economics: The Governance of Contractual Relations," *Journal of Law and Economics* (22), 1979, pp. 233-261.

Yoo, S., and Choi, H. J. "Managing on a Computer at a Korean Insurance Company," *Long Range Planning* (23:1), 1990, pp. 69-78.

Zaheer, A., and Zaheer, S. "Catching the Wave: Alertness, Responsiveness, and Market Influence in Global Electronic Networks," *Management Science* (43:11), 1997, pp. 1493-1509.

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Appendix

Resource-Based Studies in IS Research

Source/Title	Paper Type	Findings	Comments on the Use of the RBV
Sustaining it Advantage: The Role of Structural Differences (Clemons and Row 1991)	Conceptual	Argues that IT cannot, in and of itself, lead to SCA, but may assist other resources in doing so. Referred to as the strategic necessity hypothesis.	Very good conceptual work. Only loosely based on the RBV.
Information Technology and Sustained Competitive Advantage: A Resource-based Analysis Advantage (Mata et al. 1995)	Conceptual	Considers whether four IS resources lead to SCA under the resource-based view. The resources are access to capital, proprietary technology, technical IT skills, and managerial IT skills. Using logical RBV arguments, finds that managerial IT skills are the only resource that leads to SCA.	Good conceptual development. Logical rather than empirical arguments made for appropriateness of resources. Resource list not justified.
Organizational Learning and Core Capabilities Development: The Role of it (Andreu and Ciborra 1996)	Conceptual	Looks at the role IT plays in developing capabilities and competencies within the firm. Describes the role of IT within the context of organizational learning.	RBV not measured.
Develop Long-Term Competitiveness Through IT Assets (Ross et al. 1996)	Conceptual	Defines three IT assets: IT human resources asset, technology asset, and relationship asset. These assets in combination with IT processes lead to SCA.	Loosely based on the RBV. RBV not actually measured. No empirical work.
Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources (Powell and Dent-Micallef 1997)	Empirical (retail industry survey)	Supports the strategic necessity hypothesis. Finds that IT alone cannot produce SCA, but that IT can leverage other intangible, complementary human and business resources to gain SCA.	Strong empirical content although RBV not measured directly.

Catching the Wave: Alertness, Responsiveness, and Market Influence in Global Electronic Networks (Zaheer and Zaheer 1997)	Empirical	Uses an RBV framework to show that alertness and responsiveness lead to market influence in the global finance industry.	Strong empirical work. SCA is not the main dependent variable. RBV not measured.
Resource-Based Theory and a Structural Perspective of Strategy Applied to the Provision of Internet Services (Lopes and Galletta 1997)	Conceptual	Uses RBV and structural perspective of strategy to develop a series of propositions about online information services. Divides resources into knowledge-based and property-based types.	Draws on Miller and Shamsie (1996) for conceptual grounding. Hypothesizes that knowledge-based resources are more valuable in online setting. No testing of hypotheses.
IT Capabilities: Theoretical Perspectives and Empirical Operationalization (Bharadwaj et al. 1998)	Empirical	Describes the formation of an IT capability construct with six elements: IT business partnerships, external IT linkages, business IT strategic thinking, IT business process integration, IT management, and IT infrastructure.	Does not test the link between capability construct and performance or SCA.
Core IS Capabilities for Exploiting Information Technology (Feeny and Willcocks 1998)	Conceptual	Nine core IS capabilities are identified which are organized into four categories: business and IT vision, delivery of IS services, design of IT architecture, and core IS capabilities. Capabilities are mapped onto skills and values.	Interesting conceptual work. Practitioner focus. Not directly linked to RBV theory. Non-empirical.
An Information Company in Mexico: Extending the RBV to a Developing Country Context (Jarvenpaa and Leidner 1998)	Empirical (case study)	Mixed support for the RBV found in emerging country context.	RBV not measured directly. Resource attributes considered.
Information Technology Assimilation in Forms: The Influence of Senior Leadership and IT Infrastructures (Armstrong and Sambamurthy 1999)	Empirical (survey)	Looks at the influences of quality of senior leadership, sophistication of IT infrastructures and organizational size on IT assimilation.	Conceptual model only loosely based on the RBV. RBV not actually measured.

Strategic Context and Patterns of IT Infrastructure Capability (Broadbent, Weill and Neo 1999)	Empirical (survey)	More extensive IT infrastructure capability found in firms where products changed quickly and the implementation of long-term strategies was tracked over time.	
Resource View Theory Analysis of SAP as a Source of Competitive Advantage for Firms (Pereira 1999)	Conceptual	Explores whether SAP could be considered a determinant of SCA in the RBV sense. Determines that it could, if managed properly.	Non-empirical. Loosely based on the RBV. Some attributes justified with logical arguments.
Building Competitive Advantage Through Information Systems: The Organizational Information Quotient (Service and Maddux 1999)	Conceptual	Develops a series of success components through which IT can lead to SCA. Evaluation of these components leads to an organizational information quotient.	RBV logic indirectly applied.
A Resource-Based Perspective on Information Technology Capability and Firm Technology Capability and Firm Performance: An Empirical Investigation (Bharadwaj 2000)	Empirical (archival data, matched pairs)	Performance of firms which are rated to have superior IT capability in magazine survey compared to firms which do not. Performance of superior IT capability firms found to be higher.	Strong conceptual development of IT capability construct. Construct measures not used, however, in empirical analysis.
Capabilities, Business Processes, and Competitive Advantage: The Impact of Information Technology on Customer Satisfaction in the North American Insurance Industry (Ray et al. 2001)	Empirical (survey)	Study finds that managerial IT knowledge and service climate positively affect customer service performance.	Supportive of the RBV. Argues that RBV works at the level of business processes as well as at the firm level.
Information Technology and Competitive Advantage: A Process Oriented Assessment (Ray et al. 2001)	Empirical (survey)	Study finds that managerial IT knowledge leads to enhanced customer service performance but flexibility of IT infrastructure, IT technical skills, and IT applications do not.	Supportive of the RBV.
Sustaining Strategic it Advantage in the Information Age: How Strategy Paradigms Differ by Speed (Hidding 2001)	Conceptual	Argues for a strategic model that differentiates among IT types. IS strategy should depend on the length of the product cycle (ecologies).	Attempts to extend the RBV to make it more useful in quantifying sustainability of competitive advantage.

Information Technology, Core Competencies, and Sustained Competitive Advantage (Byrd 2001)	Conceptual	Argues that IT infrastructure flexibility yields sustained competitive advantage as an enabler of firm-specific core competencies.	Loosely based on RBV arguments.
Beyond Sabre: An Empirical Test of Expertise Exploitation in Electronic Channels (Christianse and Venkatraman 2002)	Empirical	Finds that RBV is more effective than Transaction Cost Economics at explaining the creation of expertise. Finds technology lock in not effective.	Constructs not explicitly operationalized as resources.
Membership Size, Communication Activity, Sustainability: A Resource-Based Model of Online Social Structures (Butler 2001)	Empirical	Uses RBV to look at online social structures. Finds complex relationships between membership size, communication activity, and online structure sustainability.	Uses resource-based logic to frame conceptual arguments. Develops notion of sustainability. Does not operationalize resources using resource attributes.
Impact of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective (Ravichandran and Lertwongsatien 2002)	Empirical	Examines complementarity from a resource-based perspective. Finds preliminary support for the relationship between IT and non-IT firm capabilities in achieving superior firm performance.	IT capability measures (unspecified) used in analysis. Link made to firms performance, not SCA.
Diversification and Performance of Japanese IT Subsidiaries: A Resource-Based View (Wade and Gravill 2003)	Empirical	Finds that Japanese IT firms that diversify internationally based on resource strengths outperform those with unrelated portfolios.	Uses the RBV as a guiding conceptual framework. Does not operationalize resources or test resource attributes directly.
Issues in Linking Information Technology Capability to Firm Performance (Santhanam and Hartono 2003)	Empirical	Extends and confirms Bharadwaj (2000). Finds that firms with superior IT capability also exhibit superior firm performance.	IT capability not operationalized, resource attributes not used in analysis. Multidimensional dependent construct used. Calls on continued use of RBV in IS research.