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**The effects of learning on relationship value in a business network context**

**ABSTRACT**

In today's intense global competition, a firm's ability to learn from its networks of business relationships is an important source of sustainable competitive advantage. Learning in a network of relationships involves a constellation of resource linkages among business partners tied together by interconnected resources. This has the potential of increasing the relationship value of a firm in terms of knowledge created through interactions among firms in the business network. Prior research has not yet examined the effects of learning in and through relationships in a business network context. Interdependence of firms in business networks gives rise to learning effects of adaptation and coordination that can have implications for relationship value. An empirical study of 215 business relationships from a network of nine high-technology companies in the United Kingdom shows that learning in and through relationships as a result of interactions and resource interdependencies in networks of relationships has a positive effect on a firm's relationship value. Furthermore, an understanding of the network context through interactions among firms facilitates learning and development of the firm's learning capabilities that enhance relationship value.

**Keywords:** Learning, Business network context, Relationship value.

## **INTRODUCTION**

The increasing global competition has resulted in more interfirm linkages that are tied together by multifaceted business relationships. These linkages are formed through human interactions in the process of developing capabilities among firms engaged in business relationships. As noted in industrial (business) networks (Axelsson and Easton, 1992; Håkansson and Snehota, 1995) and development (Lall, 1992, 1993) literatures, firms do not develop capabilities in isolation. The interactions of firms in business networks support learning through the exchange of information and resources. A business network provides a shared context that is conducive for learning and knowledge creation such as Nonaka and Konno's (1998) concept of "ba," that view a firm as a knowledge creating entity in a shared context. Thus, learning has become the only source of sustainable source of competitive advantage in today's intense global competition.

The critical questions for firms in business networks are: How does learning occur in boundaryless networks of relationships? What determine learning among firms in networks for knowledge creation? If learning helps develop the competitive advantage of the business network, what impact, if any, learning in a business network context has on the relationship value of a firm? What, then, are the implications for managing networks of relationships in order to facilitate learning and knowledge creation? Drawing on the knowledge-based theory of the firm and the network perspective, the present study attempts to provide some answers for these questions.

A business network can be defined as a set of two or more connected business relationships, where exchange in one of them is contingent upon exchange in the other relation (or non-exchange) in the other relation (Cook and Emerson, 1978). In

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business networks, a business relationship is not confined to a dyad relation but can be connected both directly and indirectly to other firms in an open system. A network of relationships may include many interfirm linkages connected directly or indirectly in order to perform relevant activities of individual firms. The interaction of firms in the business network entails the exchange, use, development and access to organizational resources. Nooteboom (1992) notes that interfirm linkages generate a ``cross-firm economy of learning.’’ The connectedness and spillover of knowledge across a variety of interfirm linkages can lead to an interfirm ecology of learning, where learning takes a network and distributed character. Thus, learning in a network of connected relationships is critical as knowledge is distributed (i.e., learning takes many dimensions through different connections) (Håkansson et al., 1999), and knowledge created through interactions cannot be owned even by the participants of the interactions (Nonaka et al., 2000).

The interactions in a network of connected relationships can be explained by resource linkages, where initial exchange is motivated by resource heterogeneity but subsequent interactions are characterized by commitment of huge amount of resources that can impede the process of learning (cf. Sorenson, 2003) as well as complement existing resources (Håkansson and Waluszewski, 2002). The term ``resource linkages’’ is used here to denote connections that are directly or indirectly established through relationships in an overall business network. Within resource linkages, interdependence exists as result of resource interdependencies of resource ties and constellations. Resource ties and constellations are underpinned by the concept of actors-activities-resources model (Håkansson and Snehota, 1995) and based on three main assumptions of business relationships: interdependence, resource heterogeneity and co-evolution (Fort et al., 1998). Since resource linkages encompass all resource

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connections in a business network regardless of importance in terms of direct interdependence, changes initiated by the firm and its immediate counterparts may affect the extent of resource interdependencies in the overall business network. An overall view of resource linkages reflects the dynamics of interaction rather than the view of isolated interdependencies between focal firms. To conceptualize learning in and through business relationships, this study investigates the learning effects of adaptation and coordination as a result of resource interdependencies and their impact on relationship value.

However, the process of learning in networks of connected relationships is complex and the measurement of learning outcomes is problematic. Previous research has examined the transfer of knowledge and skills between organizations based on the overarching resource-based view of the firm and the concept of network resource flows (e.g., Gupta and Govindarajan, 2000; Gynawali and Madhavan, 2001). The focus is on knowledge flows rather than learning, which precedes knowledge transfer and must occur in order to access new knowledge from outside the firm such as from a business network (Cohen and Levinthal, 1990). Also, knowledge flows between firms are often conceptualized and examined in terms of specific entities such as focal relationships, whereas network capabilities are not confined or owned by primary or focal relationships. In order to account for the learning effects of adaptation and coordination of connected network relationships on the relationship value of a firm, this study adopts an overall view of a firm's networks based on the relationship or interaction perspective of learning in networks (Håkansson and Snehota, 1985; Nonaka et al., 2000).

As indicated above, the relationship value of a firm connected to networks of relationships depends on interdependent resources controlled by each other through

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interfirm relationships. In this sense, the value of a relationship does not belong to an individual firm but resides in the network. This complicates a straightforward assessment of value because the value of a relationship as a whole is a composite concept and is "perceptual in nature" (Anderson et al., 1993, p. 5). Also, the value of a relationship connected to networks of relationships can be influenced by cross-relational effects of strategic action among interfirm relations and network participants (cf. Porter, 1980). This article contends that value can derive from overall resource linkages of interconnected relationships in a business network. Since it would be impossible to foresee all the effects of learning from interactions in networks of relationships, the specific outcomes of connected network relationships depend on perceptions of overall relationship value. The perceptions affect firms' actions in terms of anticipated outcomes and hence commitment of resources, which further strengthens resource linkages. More important, learning is a dynamic process that requires an understanding of human interactions as firms continuously develop and acquire knowledge. Since knowledge is context specific (Hayek, 1945), the business network provides the context for learning. Thus, the resource linkages of an overall business network have bearing on knowledge creation and relationship value (cf. Holm et al., 1999).

In the next section, the article examines the effects of learning on relationship value in a business network context by reviewing concepts related to resource interdependencies, and by specifying relevant types of learning in networks of connected relationships. The knowledge-based theory of the firm is used as a basis for explaining the implications of learning in networks of connected relationships for the relationship value of a firm. This includes specification of testable hypotheses for the research. The research methods, data analysis techniques and results are then

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presented and shared. The article concludes with a discussion of the implications for practice, theory and research.

## **THEORY AND HYPOTHESES**

### **Theoretical Foundations**

Two dominant theoretical perspectives found in the business networks and knowledge management literatures are the network perspective on markets and the knowledge-based theory of the firm. As suggested by the above definition of a business network, the network perspective is used to identify networks as a form of governance as opposed to an analytical tool (Powell and Smith-Doerr, 1994). This perspective views networks as providing an organizing structure for relations between actors (e.g., firms) and includes a diverse forms of markets such as the Industrial Districts (Piore and Sabel, 1984) and the entrepreneurial networks (Larson, 1992). Importantly, the network perspective as a governance structure does not assume an imposed structure of a dominant organization but rather it emphasizes governance as achieved through relationships, and the network as a way of understanding the generalized connectedness that prevails through relationships, particularly in business markets (McLoughlin and Horan, 2002). This generalized connectedness implies an aggregated structure of resource linkages established through interactions and interdependencies, which involve learning among exchange partners (Håkansson and Snehota, 1995). The network context of resource linkages is enacted by selective ties and relationships between autonomous actors (Håkansson and Snehota, 1995). Thus, a business network context is dynamic as the network continually learns and improves the value of their relationships.

Since capabilities embedded in the network are context specific, Nonaka and Konno (1998) propose the concept of ``ba,’’ drawing from the knowledge-based

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theory of the firm. In the knowledge-based theory of the firm, a firm is considered ``a social community specializing in the speed and efficiency in the creation and transfer of knowledge'' (Kogut and Zander, 1996, p. 503). Ba (Japanese for place) can be thought of as a shared space that serves as a foundation for knowledge creation such as networks and industrial districts. The focus is on human interactions in a specific time and space that is shared by those who interact with each other. It is through such interactions that those who participate in the context of ba itself evolve through self-transcendence to create knowledge from emerging relationships among individuals, and between an individual and its environment (Nonaka et al., 2000). A network context represents the place where the processes of learning and knowledge sedimentation take place (Corno et al., 1999).

While the network perspective and the concept of ba have similar views of the role of relationships in the process of learning and knowledge creation, the effects of learning on relationship value in a business network have not as yet been the subject of extensive empirical investigation. Much empirical work exist on the benefits of learning based on ``learning curve'' as a means of reducing production costs (e.g., Spence, 1981; Fundenberg and Tirole, 1984; Lieberman, 1984; Ghemawat and Spence, 1985), and on the organizational forms that support knowledge creation through relational trust, sharing and cooperation among participants in the network for joint performance and promoting relationship learning (e.g., Powell, 1990; Kogut, 2000; Selnes and Sallis, 2003). Also, to date, work on the dynamic creation of knowledge has been primarily conceptual and limited to the process of learning within a firm (e.g., Nonaka and Konno, 1998; Nonaka et al., 2000). Researchers have yet to investigate the effects of learning on the firm's perceptions of relationship value in an

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overall business network by analyzing the resource interdependency of firms sharing a network context, which is the focus of this study.

## **The effects of Learning on Relationship Value**

### **Relationship value**

Scholars have conceptualized and examined value in business relationships in many different ways depending on individual objectives as well as theoretical perspectives. However, there is little consensus on what constitutes value as scholars may focus on beliefs (Flint et al., 1997), competitive advantage (Wilson, 1995), goal attainment (Woodruff and Gardial, 1996), cash benefits (Anderson and Narus, 1984), and financial and social benefits (Anderson and Narus, 1999). Traditionally, value in business relationships is conceptualized as the worth of a seller's bundle of physical goods and services that is exchanged for some price with the buyer. In this instance, Newman (1988) observes that value received by customer is generally defined as the quality of the product offering divided by price.

As research on business relationships progresses, scholars have incorporated different aspects of a relationship for assessing value. Specifically, relationship value can be explored with respect to: (1) the value-in-use of the product offering that is exchanged (Wind, 1990) based on a customer's assessment of value related to the perceived economic value of alternative offerings (Forbis and Mehta, 1981); (2) value of relationship between companies is an aggregation of economic, behavioural and strategic elements (Wilson and Jantrania, 1994); (3) value as a function of criticality and quantity of goods exchanged, replaceability of the counterpart, and the cost savings resulting from the practices and procedures of the counterpart (Krapfel et al., 1991); and (4) value as perceived outcomes in specific relationship situations depending on factors that are most important to them (Ford and McDowell, 1999).



In addition, the definition of value can be categorized as either focusing on short-term monetary benefits (Gladstein, 1984) or long-term anticipation of future rewards that include non-monetary benefits (Wilson, 1995). The former is exemplified by Anderson and Narus's (1999, p. 5) definition of value as the worth in monetary terms of the economic, technical, service and social benefits a customer firm receives in exchange for the price it pays for a product offering. In contrast, a long-term view of relationship value focuses on the aggregate worth of all exchanges that will occur between two firms. This view is based on the resource-based theory that regards the relationship as a core asset of the firm (Barney, 1991; Hunt and Morgan, 1995, Eng, 2004a). Jackson (1985) proposes a single discount rate of the net present value of the cash benefits that accrue from current and future transactions. This approach explicitly acknowledges that much of the worth of a business relationship lies in the ability of the partners to identify opportunities to reduce costs or increase benefits over time. Since Jackson (1985) did not include non-monetary benefits such as technology transfer or quality improvements that can be derived from interaction of the firms, Wilson (1995) adopts a strategic perspective of value as a process requiring time for the partners to develop the trust and communication needed to find mutually beneficial outcomes from their interaction. Hogan (2001) further develops this perspective by specifying the time period in which the perceived net worth of the tangible benefits to be derived over the life of the relationship (also termed as expected relationship value). Similarly, Johnson and Selnes (2004) develop a model of customer portfolio lifetime value to examine the dynamics of value creation and the profitability of the different types of relationships over time.

The above conceptualizations offer some guidelines for estimating value in a relationship but they are either too narrow or broad and difficult to operationalize. In

particular, relationship value in a business network context can derive from interactions from the learning effects. Also, ownership of relationship value in a business network context is shared among participants and different participants value benefits differently. The dynamic nature of learning in networks of relationships means that a firm's ability to anticipate and respond to contingencies cannot be prespecified and must be learned. In other words, the effects of learning on relationship value will to a large extent depend on managerial perceptions, which guide managerial actions, such as resource allocation to particular relationships. As illustrated above, many scholars have conceptualized relationship value based on perceptions and/or in the ability to identify opportunities, i.e., anticipate outcomes. Drawing on Wilson and Jantrania's (1994) definition and both short- and long-term perspectives to relationship value, the present study conceives relationship value in a business network context as the aggregate worth of all exchanges that encompass economic, behavioural and strategic elements of a shared network context. This definition is consistent with the strategic process of knowledge-creation within a shared network context (Nonaka et al., 2000), and with the importance of behavioural factors such as trust and cooperation for promoting learning through relationships (Selnes and Sallis, 2003), though these factors are not within the scope of this research. Thus, the study's definition of relationship value includes both perceived non-monetary benefits and perceived monetary performance.

### **Learning in a business network context**

In the knowledge-based theory of the firm, knowledge has been regarded as an interconnected web of relationships in which human interpretative acts ceaselessly shape and maintain, both intentionally and unintentionally, the relational setting of the web and contextual disposition of the social reality (Kakihara and Sorensen, 2002).

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This dynamic process of learning within the network (or web of relationships) is said to produce network capabilities that are inherently tied to the interaction of agents within the firm and may include learning capabilities (Nelson and Winter, 1982; Foss, 1999). Network capabilities do not reside in or belong to an individual firm but comprise of collective resources of firms in that particular network. Such capabilities are often referred to as "tacit" or "experiential" (Johanson and Vahlne, 1977) knowledge (as opposed to explicit or articulated knowledge (Senker and Faulkner, 1996)) that is highly personal and hard to formalize, making it difficult to communicate or to share with others. For example, firm gains experience from interacting with other firms and the experience provides a reference for future interactions. This may include inexplicable subjective insights, intuitions and hunches for creating knowledge (Polanyi, 1966). In contrast, explicit knowledge is more easily processed and shared with others. The dichotomy of tacit versus explicit knowledge is well documented in the literature (e.g., Choi and Lee, 1997; Kogut and Zander, 1993; Senker and Faulkner, 1996). The implication is that network capabilities are difficult-to-imitate and to a large extent inaccessible to other firms outside the network. Learning from external partners in and through relationships becomes the key for successful acquisition of knowledge and network capabilities.

Organizational learning can be divided into: adaptive learning (single-loop learning) and generative learning (double-loop learning) (for a further discussion on different dimensions of learning see: Argyris and Schön, 1978; Shrivastava, 1983; Senge, 1990 Tomassini, 1991; McKee, 1992). Adaptive learning involves incremental change within an existing framework, occurring within a set of recognized and unrecognized constraints (i.e., the learning boundary) that reflect the organization's assumptions about its environment and itself. This form of learning is within the

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traditional scope of the organization's activities that can inhibit innovation (Leonard-Barton, 1992). Generative learning involves transformative change and the testing of underlying assumptions. It requires the development of a new way of looking at the world based on an understanding of the systems and relationships that link key issues and events. Much has been written about the way organizations learn such as from experience (Child and Kieser, 1981), through collective learning (Prahalad and Hamel, 1990) and socialization (Van Maanen and Schein, 1979). Of particular interests are the effects of learning that occur in a business network context and the implications for relationship value.

Bångens and Araujo (2002) note that firms that develop capabilities on their own may find it difficult, slow and expensive, and may end up unable to operate efficiently. This is most pertinent to tacit network capabilities, which are noncodifiable and transmitted through an individual's involvement within a specific context of interfirm relations. Stacey (2000) asserts that any knowledge always depends on a set of relationships to other knowledge in the framework of the whole social reality. As noted previously, the emergence of knowledge is embedded in a network, which facilitates the transfer and the creation of new knowledge. The main implications for learning in networks are: firms (actors) need to access and acquire relevant stocks of knowledge through interactions, and combine and convert explicit to tacit knowledge and vice versa.

Nonaka and Konno (1998) propose their SECI (Socialization, Externalization, Combination and Internalization) model as a viable approach to understanding how interactions are initiated and organized in actual social and organizational settings. They suggest four types of ba in relation to each stage of the SECI model (Kakihara and Sorensen, 2002). First, originating ba is the place where individuals share

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feelings, emotions, experiences and mental models. This type of ba is to be the platform for socialization processes in the SECI model. Physical and face-to-face interactions facilitate the sharing of individual tacit knowledge with other individuals. Second, dialoguing ba is where individuals reflect not only their own but also others' mental models and share them in an explicit form at a group level. This ba facilitates externalization process of knowledge creation. Third, systemizing ba is a place where new explicit knowledge is combined with existing explicit knowledge, being a platform for combination processes of knowledge creation. In this phase, group knowledge comes to be shared at an organization level, and effectively organized and stored, in most cases, helped by various information technology applications. Finally, exercising ba is a platform for internalization of knowledge, that is, new sets of explicit knowledge converge into individuals' tacit knowledge by, for example, on-the-job-training and participative learning.

The SECI model illustrates the process of knowledge creation through social interactions. In business markets, such interactions are driven by resource interdependencies that create linkages among firms in the network. The application of the concept of ba and SECI model shows that learning can take place in dense networks of formal and informal relationships with suppliers, customers, and other third parties such as consultants, research institutes, and educational institutions. Although the concept of ba recognizes the resource concentration of the organization's knowledge assets, the focus is on intellectualizing capabilities of the knowledge-creating firm (i.e., knowledge conversion processes). Consistent with the knowledge-based theory of the firm, this study attempts to contribute to an understanding of the effects of learning in a business network context by examining

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networks of connected relationships in terms of resource interdependencies, resource fit and network boundaries for learning in and through relationships.

### **Learning and resource interdependencies**

Learning in business networks can take different forms, namely through own development of resources, experience gained from interaction and joint learning that involves collective partners in the network (Håkansson and Snehota, 1995). The need to learn or to develop relationships with other firms is based on the assumption of resource heterogeneity (Alchian and Demsetz, 1972). For example, firms may form different relationships for economic benefits, technology, market access, economies of scale and learning. Firms develop relationships for exchange of resources that they perceive others can provide what they need. This creates interdependence in terms of the need to interact with each other for the exchange of valuable resources and to carry out activities directed to each other. Interdependence in a network of connected relationships is the extent to which business partners perceive a need for their relationship, value each other's contribution of skills, resources or value added to the relationship, and perceive that the relationship cannot be readily replaced (cf. Thompson, 1967). In this sense, interdependence is central to the actors-activities-resources model, whereby operational linkages between two or more actors, activities and resources interact and determine an outcome jointly. As such, the extent to which exchange (or non-exchange) affect one another is contingent upon the degree of dependence and interdependence. Also, each relationship is different, which could give different marginal returns depending on what resources the relationship brings with it and how they are combined.

However, the value of a relationship in a business network cannot be isolated from a single relationship, and cannot be separated from its context. As described in

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the preceding paragraphs, resource linkages in the overall network encompass resource interdependencies at the focal level of business relationships and beyond. Resource linkages give each network its own identity based on its unique resource ties and constellations (cf. Anderson et al., 1994). The concept of resource ties and constellations is conceptualized in relation to the actors-activities-resources model (Håkansson and Snehota, 1995). Resource ties comprise of two parties in the relationship whereas resource constellations include many resource ties and extend beyond immediate or direct relationships. Learning occurs through the simultaneous interaction of actors-activities-resources, as actors (firms) adapt, perform activities, and access, exchange, combine and develop resources with their counterparts.

The implication of the dynamic and simultaneous interactions of interdependent firms is that separating independent actions from a relationship will not capture the relationship value of a firm in a business network. Also, learning is a path-dependent process, where the acquisition of further knowledge depends on existing knowledge of the same kind and obstructs the acquisition of incompatible knowledge (Loasby, 1998). Tacit knowledge of capabilities dissolves clear-cut boundaries between knowing and learning about resource interdependencies of connected network relationships (Bångens and Araujo, 2002). As such, it is important that firms have a good knowledge of resource interdependencies in relation to actors and activities in their business networks. This suggests that:

Hypothesis 1 (H<sub>1</sub>): The effects of learning on relationship value in a business network context will relate positively with the extent of perceived resource interdependencies.

### **Learning and resource fit**

The type of interdependencies may involve firms relying on simple exchange of services or information to complex technologies and skills. In particular, network

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capabilities are complex as they are connected directly or indirectly to various interdependent technologies, routines, individuals and resources linked to a particular knowledge or asset (cf. Simonin, 1999). For example, technology is a complex bundle of knowledge embodied in a wide range of artefacts, human capital, procedures and organizational practices (Lall, 1992, 1993). Also, path dependence in learning (also termed as ``heaviness'') can hinder the development of new knowledge and innovations (Håkansson and Waluszewski, 2002). Although path dependence can also facilitate innovations, learning inertia due to related investments may slow down adaptations and affect relationship value. Similarly, the presence of a large variety of resources through combinations and interactions in connected network relationships has an impact on both network capabilities and relationship value. For example, interdependence can impede the process of organizational learning by interrupting the effective diffusion of information (Sorenson, 2003). This is because the generation of knowledge depends on the element of capability building (the ability to learn and know how) inside the firm (Cohen and Levinthal, 1990). Thus, it is important that specific resource interdependencies fit users and providers in the business network.

As indicated in the SECI model and the knowledge-based theory of the firm, tacit knowledge that originates from a shared network context must be converted into explicit knowledge through learning and collective understanding among network members. In order to achieve this, different knowledge bases between firms must be related. However, tacit knowledge may include individual experiences and perceptions (Polanyi, 1966), which affect the perceived value of a relationship. The extent to which tacit knowledge from networks is assimilated and internalized within the firm could also be seen as a function of resource fit (Galbraith, 1977; Tushman and Nadler, 1978). This function accounts for the fit of resource interdependencies



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among firms in the network. It indicates how well a firm makes sense of and utilizes the resources acquired in a business network context (cf. Daft and Lengel, 1986) based on the assumption that human resources (human interactions) are the producers and accumulators of knowledge within a firm (Farjoun, 1994; Chang 1996). It is worth pointing out that resource fit is not about identical resources but is concerned with knowledge or skills gaps among users and providers of resources (Hamel, 1991; Grant 1996). The premise of fit is that firms must match tacit knowledge of resource capabilities in terms of how they are used, spread, coordinated with other providers and users of resource interdependencies. This suggests:

Hypothesis 2 (H<sub>2</sub>): The effects of learning on relationship value in a business network context will relate positively with the extent of resource fit.

### **Learning and network boundaries**

In addition to resource fit, effective diffusion of knowledge is influenced by a firm's perceived boundary in the business network. But the multidimensional nature of resources implies numerous possibilities for combining and integrating a large variety of resources among firms. Håkansson and Waluszewski (2002, p. 562) note that every single resource will have as many features as there are other resources it can be combined with, and the possibilities for creating new resources by combining old ones are infinite. Resources include valuable tangible and intangible internal and external organizational assets (Wernerfelt, 1984) that may include any valued activity, service or commodity (Cook, 1977). Since network boundary extends without limits through connected relationships or boundaryless (Anderson et al., 1994), learning to acquire and combine resources with the variety of network members can present opportunities as well as threats in terms of uncertainty with demand and technology. A firm must have bounded knowledge of its network boundary to take advantage of network

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opportunities or to cope with uncertainties. Such knowledge is developed through interactions among individuals that cannot be owned even by the participants of the interactions (Nonaka et al., 2000). In other words, interactions produce knowledge (Kakihara and Sorenson, 2002), and relationships facilitate learning through interactions rather than through sheer ownership of valuable resources.

The effects of learning on relationship value can be described as a process of using, accessing, adapting, combining, coordinating and developing resources in the evolution of a business network. Interactions through exchange relationships are important catalyst for the evolution of interfirm relationships in terms of knowledge acquisition, accumulation and creation. For example, exchange of resources among a small number of firms can have important knowledge spillover and resource linkage effects for the overall business network (Piore and Sabel, 1984). Such effects contribute to network capabilities particularly over time and embedded in the business network context. The multiple dimensions of resources have two important implications for relationship value. Firstly, the firm's knowledge of network boundaries in terms of strategic resource linkages can affect knowledge sharing and development. Secondly, the dynamics of a business network context can bring about change, and hence knowledge hinges on ongoing relationship development. These highlight the importance of learning in business networks and its potential impact on relationship value. The multifaceted dimensions of resources for learning can be facilitated through relationships, in that, the more dense the firm's connections (boundaries) the more opportunity to learn and enhance relationship value. Also, it can be argued that a firm's resources that are interdependent and connected to network relationships will increase the potential for learning among partners in a business network. Thus, it is hypothesized:

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Hypothesis 3 (H<sub>3</sub>): The effects of learning on relationship value in a business network context will relate positively with the firm's relationship connections.

Hypothesis 4 (H<sub>4</sub>): In a business network context, the firm's resource interdependency and relationship connections will increase learning effects in the form of relationship value.

### **Learning capability and relationship value**

In the knowledge-creating theory of the firm, the capability of each firm to use the communicative potential of the network is the key for absorption, creation and diffusion of knowledge (Corno et al., 1999). As Schendel (1996, p. 3) points out: the process of learning rather than what is learned, meaning that the capacity to develop organizational capability [in knowledge management] may be more important in creating competitive advantage than the specific knowledge gained. The ability of a firm to learn by assimilating and internalizing external knowledge such as in a business network context is critical for coping with change as well as for exploiting emergence of new knowledge from interactions. The importance of knowledge internalization is consistent with the SECI model, for example, the model stresses the importance of absorptive capacity (Cohen and Levinthal, 1990) and identifies six organizational factors that affect the rate of knowledge conversion between explicit knowledge and tacit knowledge through interactions: knowledge vision, organizational form, incentive system, corporate culture and organizational routines, and leadership (Nonaka et al., 2000).

A network of connected relationships provides the context for learning, and for developing specific capabilities based on the existing resources and the dynamics of a network context. This learning capability is also known as dynamic capability (Teece et al., 1990), that is, a firm's ability to use existing firm-specific capabilities

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and develop new ones. It can be accumulated only through learning-by-doing. The simultaneous interaction of actors-activities-resources in business networks reflects a collective practice of learning-by-doing in a shared context that takes place with others and in relation to others. The effects of learning in and through relationships on the value of a relationship have been recognized in the formation of international joint ventures (e.g., Beamish and Banks, 1987; Hamel, 1991; Grant and Baden-Fuller, 1995) but have not yet been empirically examined in a business network context. In this instance, the interfaces between firms can bring about access to complementary but dissimilar capabilities of other firms. As such, learning provides the potential of enhancing the value of resource combinations in connected network relationships.

Since learning is path-dependent and cumulative, the importance of combining prior experience with present knowledge for a firm's learning capability is supported by the business network context. As noted earlier, a business network context is shared, created and utilized for the firm's prior related knowledge, which is a function of a firm's absorptive capacity (Cohen and Levinthal, 1990). Individual experiences and perceptions of tacit learning predetermine a firm's ability to use context specific knowledge (see von Hippel, 1994). For example, Zander and Kogut (1995) emphasize that cumulative experience with a technology is a critical factor in understanding new technologies. This form of experiential-based learning can derive from the function of an organization's age and effort (Garvin, 1993). Researchers have considered experiential learning as the ability to learn (e.g., Grewal et al., 2001) or organizational capabilities (e.g., Prahalad and Hamel, 1990). The main implication is that current knowledge base of a firm will need to match prior experience of connected network relationships in order to upgrade existing resources. Thus, the following final hypotheses are based on the notion that a network context can be seen as a knowledge

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base for related exchange of valuable resources among firms and for enhancing relationship value.

Hypothesis 5 (H<sub>5</sub>): The effects of learning on relationship value in a business network context will relate positively with the firm's learning capability.

Hypothesis 6 (H<sub>6</sub>): In a business network context, the firm's resource fit and learning capability will increase learning effects in the form of relationship value.

## **METHOD**

### **Sample and Data Collection**

The sampling frame of this study was a random list of 500 medium-sized high-technology firms located in one geographical region in the southeast of England. The high-tech firms were selected based on Standard Industrial Classification (SIC) codes from a national business directory. The concentration of high-tech firms in one geographical region provided a suitable research context. They are highly networked to deal with the complex nature of technology business that demands a high degree of specialisation, learning and knowledge exchange, and cooperation with external partners (Eng, 2004b).

In order to examine networks of relationships, all the relationships connected through a firm's focal relationships both directly and indirectly had to be considered. If networks of relationships were analyzed in relation to the focal company, research access granted by several companies would generate a large number of connected relationships, which could include many companies from the sampling frame. A random sample of 50 firms was drawn from the sampling frame with prior knowledge that negotiating research access would be difficult. The Chief Executive Officers (CEOs) or Managing Directors of each company were first contacted by telephone to seek research access, verify company characteristics, and identify key informants. A

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total of nine companies agreed to participate on the condition that the identity of the firms is kept anonymous. Of the nine companies, 215 business relationships (connected firms) were identified and these relationships constituted their networks of connected relationships.

Before the administration of the survey, key informants (names) responsible for individual business relationships or strategic business units were identified through the nine companies. Criteria for selecting key informants such as being knowledgeable about the phenomenon under study were used for informant selection (Campbell, 1955). A questionnaire was developed and pretested with managers from the nine companies. Refinements on wording of scale items were made accordingly (see Table 2 for measurement items). Each informant was subsequently mailed the required number of questionnaires for the firm's network relationships and requested to complete them with respect to the learning effects of resource interdependency, resource fit, relationship connections and learning capability on the firm's relationship value with whom it is connected.

### **Measures**

The dependent variable, value of a relationship, was measured by a set of items describing the firm's expected financial gains and perceived non-monetary benefits from connected network relationships. As noted previously, common criticisms of a relationship value measurement are: it does not account for non-cash benefits, long-term costs and benefits and future outcomes. Thus, for the purpose of this study, relationship value was measured by taking into account non-monetary benefits (Wilson, 1995) and performance outcomes (Gladstein, 1984). The former is strategic and based on perception about future outcomes of the interaction between firms, such as technology transfer or quality improvements that can be derived from the ongoing

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interaction of the firms. Performance outcomes can be viewed as the perceived aggregate worth of outcomes related to current and future benefits of a relationship such as satisfaction, profitability and sales volume. The focus on transaction and long-term benefits is consistent with the inherently dynamic nature of business relationships (Anderson and Narus, 1999; Wilson, 1995; Hogan, 2001).

The main independent variables examined in relation to relationship value of firms connected network relationships were: (1) resource interdependency, (2) resource fit, (3) relationship connections, and (4) learning capability. Firstly, resource interdependency, examines the dependence and joint use of resources between firms in verifying the effects of learning on relationship value. The resource interdependency items were adapted from Cannon and Perreault's (1999) scale of operational linkages, which has been validated in terms of its internal psychometric properties. This measure captures the extent to which systems, procedures and routines are interlinked to facilitate operations, where learning through relationships occur in intercoupled systems of actors-activities-resources to facilitate the flow of goods, services or information. Secondly, resource fit was based on the similarity of human resource profiles between a firm and a particular business (Farjoun, 1994; Chang, 1996). The items in the resource fit scale describe the extent to which availability of the knowledge base of a firm is related to connected relationships. For example, previous research suggests that the higher the resource fit in terms of leveraging related resources and intangible skills, the greater the potential for sharing tangible resources in areas such as procurement and production (Biggadike, 1979; Farjoun, 1994). Thirdly, relationship connections, examine a firm's perceived knowledge of network boundary that affects intensity of actors-activities-resources interactions and chain of activities in a business network. In other words, the closer

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the interactions with network members, the more resource dimensions provide learning opportunities. This is consistent with the notion that closely linked actors increase the effects of learning through interlinking activities and resources (Anderson et al., 1994). Finally, learning capability, describes the firm's experience and knowledge of learning and applying external knowledge of connected relationships. The perception of knowledge is based on the notion that the firm's ability to learn is limited by the degree of experience of the knowledge seeker (Grant, 1996; Simonin, 1999).

Additionally, two control variables were included in the analyses to control for other effects of learning on relationship value. First, it is possible that a firm's dependence on partners' resources may not result in learning such as in protected patents and contracts for access to resources rather than for use and development. To control for this effect, the measure of resource coordination was used as a proxy for learning from external partners such as joint and collective learning. As Håkansson and Snehota (1995) note, the need to coordinate necessitates learning to use and combine other resource elements which gives different marginal returns depending on what other resources they are combined with. Second, while closer interactions between firms may provide a wider scope of exploration for the use and combination of resources, relationship value may be affected by any relationship in a business network regardless of whether they are closely linked or not. The measure of the number of connected relationships that has bearing on relationship value was included in the analyses. Presumably, the more the number of connected relationships, the larger the available number of resource interfaces for learning in terms of closely linked activities and resources.



### **Measure Validation**

The multi-item measures, resource interdependency, resource fit, relationship connections, learning capability and relationship value were subjected to item-to-total correlations and exploratory factor analysis to verify unidimensionality. Each set of items was examined to identify items that did not belong to the specific domain. The correlation matrix for the variable set is shown in Table 1. Using LISREL VII (Jöreskog and Sörbom, 1989), the resulting pool of items was subjected to confirmatory factor analysis to verify the hypothesized factor structure. Five factor models of the measures were estimated using the maximum likelihood fitting function.

<Take in Table 1 about here>

As shown in Table 2, there is a good fit to the data ( $X^2 = 83.61$ , d.f. = 51,  $p = .015$ ), Comparative Fit Index (CFI; Bentler, 1990) = .94; Incremental Fit Index (IFI; Bollen, 1989) = .92; Root Mean Square Residual (RMSR) = .062; Root Mean Square Error of Approximation (RMSEA) = .046). To assess discriminant validity, a series of chi-square difference tests on the respective factor correlations were performed by comparing two models: the original five constructs being distinct is constrained to equal 1.0 and another in which the correlation is free to vary. Each provided evidence of strong evidence of discriminant validity. Finally, the coefficient alphas for the item sets show reasonable evidence of reliability. Measures of alphas ranged from .78 to .96.

<Take in Table 2 about here>

A further test of construct validity was performed by comparing the multi-item independent variables with a dissimilar measure of the estimated number of years required to develop a relationship. All correlations are positive and significant as expected ( $r = .40, p < .001$ ;  $r = .35, p < .001$ ;  $r = .41, p < .001$ ;  $r = .36, p < .001$ ) for resource interdependency, resource fit, relationship connections and learning capability respectively. All the measures demonstrate evidence of convergent validity.

### **Hypotheses Tests and Results**

<Take in Table 3 about here>

Table 3 summarizes the results of hypothesis tests, using an ordinal least squares regression model. The main effects of  $H_1$  to  $H_3$  and  $H_5$ , involved regressing the variable of relationship value against each of the four main independent variables. The interaction terms of  $H_4$  and  $H_6$  examined the interaction between the independent variables against the dependent variable of relationship value. Typically, multiplying the appropriate independent variables creates indicators for the interaction terms. But this approach is prone to collinearity (Jaccard et al., 1990). In order to avoid this limitation, the interaction effects were computed by following the standard procedures of three-stage least squares model to obtain significant increase in explained variance (for statistical details, see Hansen, 1982; White, 1983).

As shown in Table 3, all the hypotheses are supported. The effects of learning on relationship value relate positively with the extent of perceived resource interdependencies, as  $H_1$  predicts ( $t = 2.38, p < .01$ ). There is evidence that resource fit between firms in networks of relationships helps firms make sense of knowledge acquired in a business context, which has a positive influence on relationship value

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(H<sub>2</sub>:  $t = 2.17$ ,  $p < .05$ ). A firm's view of its network boundary not only determines the intensity of interactions with business partners but also influences opportunities for learning and enhancing relationship value (H<sub>3</sub>:  $t = 2.13$ ,  $p < .01$ ). The corresponding interaction term between resource interdependency and a firm's relationship connections is also statistically significant (H<sub>4</sub>:  $t = 2.64$ ,  $p < .05$ ). The results support that a firm's learning capability is supported by interactions and knowledge base of a shared network context (H<sub>5</sub>:  $t = 3.21$ ,  $p < .10$ ). Moreover, the interaction term between resource fit and learning capability is significant (H<sub>5</sub>:  $t = 3.48$ ,  $p < .05$ ). These results suggest that learning in and through relationships is facilitated by prior experience and specific network context, which has a positive influence on relationship value.

For the control variables, the results lend support for H<sub>1</sub> ( $t = 2.45$ ,  $p < .01$ ), that resource interdependencies among firms in networks of relationships derive from actors-activities-resources model are likely to involve resource coordination that require interfirm learning. Finally, firms connected to a large number of relationships do not necessarily have a positive influence on relationship value ( $t = - .74$ ,  $p > .10$ ). As confirmed by H<sub>3</sub>, the results indicate that the greater the interface of resource dimensions between firms in a relationship, the more intense the development and use of resources or the more opportunities for learning, regardless of the number of firms connected to the network of relationships. This has a positive influence on relationship value.

## **DISCUSSION**

### **Theoretical Implications**

As noted by the actors-activities-resources model, firms in connected relationships interact and learn to use and access each other's contribution of resources to the relationship. The results of this study suggest that resource interdependencies in

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business networks provide firms with the opportunities to learn from each. In a business network context, the notion of interdependence is not limited to individual perceptions of dependence but it can include established routines (Nelson and Winter, 1982) over time through interactions that enhance relationship value. The established routines embedded in a shared network context serve as the platform for knowledge creation through constant interactions among individual firms. This platform is analogous to knowledge frames that capture linkages of individual units of knowledge and their priorities (Kusunoki et al., 1998). Consistent with the concept of *ba*, the shared network context allows firms to interact and share their knowledge base such as resources within the knowledge frames of established routines, skills and experience. The co-evolution of relationships enables firms in a specific network context to build up incremental knowledge. In this sense, the creation of knowledge from emerging relationships in a network context may take advantage of the existence of knowledge shared and the availability of network resources in a particular network context.

Although resource interdependency may impede the process of organizational learning by requiring timely coordination of resources and dissemination of information among individual firms (cf. Sorenson, 2003), exchange and development of critical resources in business relationships do not occur without cooperation and substantial investment of time. In a business network context, firms co-evolve, for example, in the search for business solutions to their problems, and they apply knowledge from their interactions. This co-evolutionary nature of business relationships is likely to support learning, though individual firms may be constrained by ``heaviness'' of resources that relationships create (Håkansson and Waluszewski, 2002) such as learning inertia and by prior experience of knowledge seekers (Grant,

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1996). In this respect, the results of this study indicate that a firm's resources that are interlinked with business partners has a positive influence on relationship value. The effects of learning on relationship value cannot be separated from the networks of relationships in which the firm is embedded. This implies that learning to enhance relationship value in a business network is the result of a network of actions and interdependencies rather than optimization of routines through an individual firm.

As indicated by the SECI model of the theory of knowledge-creating firm, sharing explicit knowledge involves combining and disseminating relevant data to users. In a business network context, the variety of resources from connected network relationships needs to be assessed, adapted and coordinated to fit the purpose of the firm in terms of benefits for developing competitive advantage, such as complementary assets and new technology. For example, the utilization of interdependent resources of network members requires coordinating mechanisms in order to organize collective inputs for strategic action. Also, the more coordinating effort is required as a result of skills gap (Hamel, 1991) and resource incompatibility (Barney, 1991), the less the value added to a relationship. This study proposed that the effects of learning on relationship value are influenced by resource fit between firms. There is evidence that firms with a higher resource fit in exchange relationships have a positive influence on relationship value. This finding suggests that an important aspect of knowledge combination and internalization in the SECI model is ensuring that resource interdependencies are built upon existing knowledge base through interactions in a business network context. However, the process of knowledge internalization was not the focus of this study.

Consistent with Cohen and Levinthal's (1990) concept of absorptive capacity, this study shows that a firm's prior related knowledge of interacting with exchange

partners and its understanding of resources utilized in interactions have a positive influence on relationship value. The presence of resource fit in a firm's learning capability significantly increased the degree of influence on relationship value. The results suggest that the firm's prior stock of knowledge (i.e., experience) is related to the network context, in that the level of familiarity with network resources and context facilitate learning in and through relationships. Knowledge cannot be understood without understanding situated cognition and action (Suchman, 1987). The dense and varied networks of relationships provide a dynamic context for learning-by-doing and/or learning-by-interacting that constitutes the learning capability of firms. In essence, the firm's learning capability resides both within the organization as well as in a shared business network context particularly in relation to the sharing of a common stock of knowledge. For example, it is difficult to disentangle socially constructed experience clouded by interactive complexity and shaped by many actors simultaneously from complicated combination of resources specific to the context. Thus, learning in and through relationships is the key for matching and combining current capabilities for the development of new knowledge such as in the effort to enhance relationship value.

An important characteristic of business relationships is the presence of connected resource ties and constellations. The study provides support for the existence of multiple facets of resource inter-linkages between firms. Conceivably, there are limitless potential for firms to learn from using and combining resources of a business network. The stability and variety of relationships provide a dynamic setting for constant adaptation of resources in relationship development and in response to change (Håkansson and Snehota, 1995). As illustrated by the results, resource linkages that are critical for the firm's relationship value comprised of densely

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connected relationships in terms of resource usage and exchange. In other words, it is the interface of resources through active relationship development that engage the interaction of actors-activities-resources rather than merely connected network relationships. Individuals in business relationships can be regarded as learning agents of the firm in the process of acquiring and creating knowledge that belonged or shared by network members through interactions. From a theoretical perspective, the present research provides some preliminary insight into the importance of a business network context for the firm's learning capability and the significance of resource usage and exchange through interactions.

### **Practical Implications**

The study shows that learning effects on relationship value of a firm in a business network context are influenced by the perceived resource interdependencies, resource fit, relationship connections and learning capability. The presence of learning effects on relationship value in relation to resource interdependencies suggests that interactions between firms in a business network context are important sources of knowledge creation. However, the dynamics of resource interdependency in terms of their effects on relationship value can rarely be fully specified in advance and by extension, they are difficult to manage. Therefore, learning to add value to existing relationships from the knowledge base of a business network is critical for long-term success.

From a practical standpoint, the implications for firms in connected relationships are two-fold. Firstly, learning in and through relationships can build-up substantial experience bases for leveraging complementary assets from resource interdependencies. The results suggest that prior experience of firms in terms of perceptions (tacit learning) of capabilities affect relationship value. Although learning

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is path dependent, e.g., acquiring or switching to new capabilities are constrained by learning inertia, knowledge bases and capabilities gained from learning through interactions are embedded in a network context. The task of exploiting the creation of knowledge within a particular business network depends collectively on all the network members rather than on any single firm. In particular, externalization of knowledge requires learning-by-doing which is non-transferable through markets (Cohen and Levinthal, 1990). This suggests that from learning-by-doing firms that recognize the resource fit of interdependent network resources and strategic actions are more likely to succeed in learning or importing knowledge from partners.

Secondly, firms that enter into various relationships have to commit resources, such as sharing resources with exchange counterparts in the process of learning-by-doing. Although resource commitments are essential in relationship development, they can be costly in terms of time and non-recoverable costs associated with exchange of resources. In light of this, the results provide some insight into the role of connected network relationships underlie by dense and varied resources rather than by merely having many relationships to increase learning opportunities. This is consistent with the notion of information stickiness where the path dependent nature of learning renders the difficulty of knowledge transfer between firms. In a business network context, there is stability for learning particularly for converting explicit knowledge into the firm's tacit knowledge and subsequently deploying the tacit knowledge (cf. Kogut and Zander, 1992; Corno et al., 1999). Therefore, firms that regard their network context as a repertoire of knowledge bases and as dynamics of interaction supported by business relationships are likely to open up learning opportunities and enhance relationship value.



Since the study examined all connected network relationships of each firm, the study can better capture the learning effects in business networks than subsume learning to an individual firm detached from its networks of relationships. This approach is robust to allowing learning effects to be examined across firms. Given the inseparable dynamic interactions of knowledge in a business network context, it is important that firms adopt a network view of connected relationships emerging from interaction. Of particular interest to firms is the immobility of knowledge created within a business network, also known as network capabilities (Håkansson, 1993; Foss, 1999), which not only impact positively on relationship value but may also help sustain competitive advantage. While it is not within the scope of this study to examine the process in which firms import and transfer network capabilities with each other, firms must make strategic commitments and decisions pertaining to the incremental nature of learning and knowledge accumulation. In other words, firms may need to allocate more resources to certain relationships and balance the trade-off of current profitability against longer-term success. This also has implications for current related knowledge (tacit) and the firm's future ability, internal capacity to evaluate, absorb and utilize complex processes embedded in a business network context.

## **LIMITATIONS AND FURTHER RESEARCH**

It is worth noting some limitations of this research. The data of this research were limited to one industry for examining the effects of learning in a homogeneous network context. This limits the generalizability of the findings. Furthermore, this research only begins to explore why firms learn in a business network context in the first instance and its perceived impact on a firm's relationship value. Inevitably, from a practical viewpoint, the use of perceptual data to test the hypotheses was

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necessitated primarily due to the complexity of learning phenomena in connected networks of relationships, though it has been widely documented that managers' perceptions shape behaviour and are critical for choice of relationships in strategy making (e.g., Venkatraman and Ramanujam, 1986, 1987; Lefebvre, 1997; Spanos and Lioukas, 2001).

Finally, some research questions remain unanswered. In particular, the specific relationship governance mechanisms for knowledge externalization and internalization in a business network context deserve future research attention. This has important implications for the firm's learning capabilities and mobilization of network capabilities. For example, if learning to acquire knowledge and utilize network capabilities is dynamic and socially constructed through interactions in a shared network context, there is a need to understand how to manage complex chain of resource interdependencies in order to mobilize collective capabilities embedded in a network context. Given creation of new knowledge out of existing knowledge can only be accumulated through learning-by-doing (Nonaka et al., 2000), examining the link between dynamics of relationships in a network context and learning strategies through interactions can be a fruitful research area.

Table 1: Correlation Matrix

	1	2	3	4	5	6	7
1. Resource interdependency	1.00						
2. Resource fit	.21	1.00					
3. Relationship connections	.49	.07	1.00				
4. Learning capability	.04	-.05	.15	1.00			
5. Relationship value	.20	.16	-.03	.41	1.00		
6. Resource coordination	-.24	.31	-.18	.12	.03	1.00	
7. No. of connected relationships	.02	.07	-.14	.14	.17	.05	1.00

Notes: Correlations greater than .14 are significant at  $p < .05$  for  $n = 21$

Table 2: Multi-Item Scales

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Measures and items

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*Resource interdependency*  $\alpha = .81$

(3 items, 7-item Likert Scale, ``Strongly Disagree – Strongly Agree’')

Our resources are closely linked to other firms in the network.

Our relationships with firms in the network are essential to our business operation.

Some of our resources are closely connected to firms in the network.

*Resource fit*  $\alpha = .78$

(3 items, 7-item Likert Scale, ``Strongly Disagree – Strongly Agree’')

Our experience and skills are closely related to connected relationships.

Our important business relationships are related to our target product markets.

A large proportion of our resources match our existing business relationship needs.

*Relationship connections*  $\alpha = .85$

(3 items, 7-item Likert Scale, ``Strongly Disagree – Strongly Agree’')

Our directly connected relationships are characterized by intense interactions between individuals and firms.

Our important business relationships provide multiple resources in business interactions.

A large proportion of our business activities are supported by closely linked network relationships.

*Learning capability*  $\alpha = .92$

(4 items, 7-item Likert Scale, ``Strongly Disagree – Strongly Agree’')

We thought learning would increase our efficiency.

We expected learning to reduce our costs associated with managing relationships in the network.

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We thought learning would streamline our business with other business partners in the network.

We believed that learning would reduce the cost associated with transacting business with our exchange partners.

*Relationship value*  $\alpha = .96$

(4 items, 7-item Likert Scale, ``Strongly Disagree – Strongly Agree’')

A large proportion of our volume of business comes from relationships in the network.

We form relationships with other firms in the network to gain non-monetary revenues such as competence, market position and social rewards.

A large number of our business contracts are the result of our business relationships with firms in the network.

The profitability of our relationships to a large extent is influenced by other firms in our business networks.

**Five-factor measurement model**  $X^2 (51) = 83.61 (p = .015)$

CFI = .94; IFI = .92; RMSR = .062; RMSEA = .046

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Table 3: Estimated Model – Dependent Variable: Relationship Value

Independent Variables	Unstandardized Coefficient	T- Value
Constant	8.79	12.10**
Resource interdependency	.14	2.38***
Resource fit	.18	2.17**
Relationship connections	.16	2.13***
Resource interdependency	.06	2.64**
X relationship connections		
Learning capability	.35	3.21*
Learning capability	.018	3.48**
X resource fit		
Resource coordination	.28	2.45***
No. of relationships	.39	2.67*
Adjusted R <sup>2</sup> = .31		
F-ratio = 7.03***		

\* p < .10

\*\* p < .05

\*\*\* p < .01

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### **Executive summary and implications for managers and executives**

The interactions of firms in business networks support learning through the exchange of information and resources. Analyzing the learning effects of adaptation and coordination of connected network relationships on the relationship value of a firm can help firms learn from business partners and take advantage of network capabilities in a business network context.

### **The network perspective**

Consistent with the view of networks as a way of understanding the generalized connectedness that prevails through relationships, a business network context is enacted by selective ties and relationships between autonomous actors. A business network context provides a shared context that facilitates learning in the exchange, use, development and access to organizational resources. Since firms do not develop capabilities in isolation, the relationship value of a firm connected to networks of relationships depends on interdependent resources controlled by each other through interfirm relationships.

### **The knowledge-based theory**

The knowledge-based theory stresses the importance of human interactions in a shared space such as a business network context where the processes of learning and knowledge creation take place. The relational setting of a business network includes tacit network capabilities that are difficult-to-imitate, and hence learning in and through relationships has become the key for developing sustainable competitive advantage.

### **Research findings**

A survey of 215 connected business relationships at nine medium-sized high-technology companies in the southeast of England shows that learning in and through relationships as a result of interactions and resource interdependencies in networks of relationships has a positive effect on a firm's relationship value. The effects of learning on relationship value relate positively with the extent of perceived resource interdependencies. Resource fit between firms in networks of relationships helps firms make sense of knowledge acquired in a business network context.

The research suggests that a firm's learning capability is supported by interactions and knowledge base of a shared network context. Prior experience and established routines embedded in a shared network context serve as the platform for knowledge creation, which have a positive influence on relationship value. Co-evolution in business relationships enables firms in a specific network context to build up incremental knowledge. The results also show that the more intense the development and use of resources, the more opportunities for learning from counterparts.

The overall results suggest that the effects of learning on relationship value through using, accessing, adapting, combining, coordinating and developing resources in the evolution of a business network can have a positive impact on relationship value.

### **Managerial implications**

The study provides insights into the importance of strategic commitments and decisions pertaining to the allocation of scarce organizational resources to certain relationships for the purposes of accessing, acquiring and developing tacit knowledge



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in a business network context. This is in line with the incremental nature of learning and knowledge accumulation that a firm's internal capacity is related to both prior stock of knowledge and the network context supported by learning-by-doing over time. In addition, the effects of learning on relationship value in relation to resource interdependencies suggest that interactions between firms in a business network context are important sources of knowledge creation. However, learning is also path dependent and costly in terms of time and non-recoverable costs associated with exchange of resources. The results provide some insight into the role of connected network relationships in rendering a shared context and stability for learning, namely for converting explicit knowledge into the firm's tacit knowledge and subsequently deploying the tacit knowledge. The task of exploiting the creation of knowledge in a business network depends collectively on all the network members rather than on any single firm. This means that a firm's learning capability for knowledge utilization and evaluation resides both within the organization as well as in a shared business network context. Thus, the key to enhancing relationship value is learning in and through relationships, as there are conceivably limitless potential for firms to learn from using and combining resources in a business network setting.