

■ Case Study

Predictors of Information Technology Support for Inter-organizational Knowledge Management: Lessons Learned from Law Firms in Norway

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Law firms represent an industry that seems very well suited to knowledge management investigation. They are knowledge intensive, and the use of advanced technology may well transform these organizations in the future. This paper reports results from a survey of Norwegian law firms on the use of information technology to support inter-organizational knowledge management. Two predictors of IT support were significant: firm cooperation and knowledge cooperation. Inter-organizational trust was not a significant predictor. Software and systems most frequently used include word processing, electronic mail and legal databases. Copyright © 2001 John Wiley & Sons, Ltd.

INTRODUCTION

A new perspective on knowledge in organizations is being created. Organizations are viewed as bodies of knowledge (Blaauw and Boersma, 1999; Davenport *et al.*, 1998; Nonaka, 1994, 1995), and knowledge management is considered an increasingly important source of competitive advantage for organizations (Ginsburg and Kambil, 1999; Nahapiet and Ghoshal, 1998). Law firms represent an industry which seems very well suited for knowledge management investigation (Lamb, 1999). They are knowledge intensive, and the use of advanced technology may transform these organizations in the future (Terrett, 1998).

Little empirical research has been conducted on information technology (IT) support for knowledge management. Most published research develops recommendations for successful knowledge management without an empirical basis (e.g. Davenport *et al.*, 1998; Fahey and Prusak, 1998).

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The study presented in this paper complements existing research by focusing explicitly on the use of IT to support knowledge management in law firms, while contributing to the body of empirical knowledge management research (e.g. Alavi and Leidner, 1999; Ruggles, 1998). This research makes a contribution to the emerging knowledge-based view of the firm applied to professional service firms. This paper explores some important and contemporary issues concerning knowledge management by viewing organizations as knowledge systems, and it reports results from a survey of Norwegian law firms on IT support for inter-organizational knowledge management.

RESEARCH ASPECTS

Knowledge

The special capabilities of organizations for creating and transferring knowledge are being identified as a central element of organizational advantage (Nahapiet and Ghoshal, 1998). Knowledge embedded in the organization's business

processes and the employee's skills provide the firm with unique capabilities to deliver customers with a product or service. Scholars and observers from disciplines as disparate as sociology, economics, and management science agree that a transformation has occurred — knowledge is at center stage (Davenport *et al.*, 1998).

Distinctions are often made between data, information, knowledge and wisdom. Knowledge is information combined with experience, context, interpretation, and reflection (Davenport *et al.*, 1998). Knowledge is a renewable, re-usable and accumulating asset of value to firms which increases in value with employee experience and organizational life (Ginsburg and Kambil, 1999). Knowledge is intangible, dynamic and without boundaries, and if it is not used at a specific time in a specific place, it is of no value (Nonaka and Konno, 1998). According to Fahey and Prusak (1998), knowledge is what a knower knows; there is no knowledge without someone knowing it. Alavi and Leidner (1999) further contend that information becomes knowledge once it is processed in the mind of an individual. This knowledge then becomes information again once it is articulated or communicated to others in the form of text, computer output, spoken, or written words or other means.

Knowledge Management

Knowledge management (KM) was introduced to the business world to help companies create, share, and use knowledge effectively (Davenport *et al.*, 1998). Although potential benefits are plentiful, many scholars are concerned that this is just another fad (Swan *et al.*, 1999). Based on such warnings, it is important to maintain realistic expectation levels when planning and implementing KM in organizations.

Information Technology

The concept of coding and transmitting knowledge in organizations is not new: training and employee development programs, organizational policies, routines, procedures, reports, and manuals have served this function for many years. What is new and exciting in the KM area is the potential of using modern information technologies (e.g. the Internet, intranets, extranets, browsers, data warehouses, data filters and software agents) to systematize, facilitate, and expedite firm-wide KM (Alavi and Leidner, 1999). The critical role for IT lies in its ability to support communication, collaboration, and those searching for knowledge (McCampbell

et al., 1999), and its ability to enable collaborative learning (Alavi *et al.*, 1997).

Many organizations have initiated a range of projects and programs where the primary focus has been on developing new applications of IT to support the digital capture, storage, retrieval, and distribution of an organization's explicitly documented knowledge (Zack, 1999). Artificial intelligence systems such as expert systems, neural nets, fuzzy logic and generic algorithms capture and codify knowledge while group collaboration systems, like groupware and extranets, share knowledge. Office automation systems, including word processing, desktop publishing, imaging, electronic calendars and desktop databases distribute knowledge, and knowledge work systems such as CAD, virtual reality and investment workstations create knowledge.

As examples of IT projects to support KM, Ruggles (1998) lists creating an intranet, data warehousing, creating knowledge repositories, implementing decision-support tools, implementing groupware to support collaboration, creating networks of knowledge workers, mapping sources of internal expertise, establishing new knowledge roles, and launching new knowledge-based products and services.

An intranet may be classified as a KM application since it is capable of distributing knowledge, while not every intranet project should be considered a knowledge management effort, intranets are often used to support knowledge access and exchange within organizations (Ruggles, 1998). According to Newell *et al.* (1999), intranets are often implemented with KM as the primary focus. That is, intranet systems are seen as a tool for the more efficient sharing and creation of knowledge within organizations. Lamb (1999), meanwhile, studied intranets in international law firms in the USA. She found that only 20% of the law firms had intranets in 1998, but that this percentage was growing rapidly.

The ability to analyze and code knowledge often requires one to have an in-depth expertise of the sociocultural environment related to the knowledge. It has been suggested that expert systems can be used to improve coding where the expert's vocabulary contains the set of generalized concepts necessary to express the knowledge of others (Carley, 1988).

While having considerable potential, the availability of electronic knowledge exchange does not automatically induce a willingness to share information and build a new intellectual capital. Major changes in incentives and culture may be required to stimulate use of new electronic networks, and

motivated creativity is a fundamental influence in the creation of value through leveraging intellect (Nahapiet and Ghoshal, 1998).

Law Firms

A law firm can be understood as a social community specializing in the speed and efficiency in the creation and transfer of legal knowledge (Nahapiet and Ghoshal, 1998). Edwards and Mahling (1997) categorized the types of knowledge involved in the practice of law as administrative data, declarative knowledge, procedural knowledge, and analytical knowledge. Administrative data includes all the nuts and bolts information about firm operations, such as hourly billing rates for lawyers, client names and matters, staff payroll data, and client invoice data. Declarative knowledge is knowledge of the law, the legal principles contained in statutes, court opinions and other sources of primary legal authority; law students spend most of their law school careers acquiring this kind of knowledge. procedural knowledge involves knowledge of the mechanics of complying with the law's requirements in a particular situation: what documents are necessary to transfer an asset from Company A to Company B, or what forms must be filed where to create a new corporation. Declarative knowledge is sometimes labeled know-that and know-what, while procedural knowledge is labeled know-how (Nahapiet and Ghoshal, 1998). Finally, analytical knowledge pertains to the conclusions reached about the course of action a particular client should follow in a particular situation. Analytical knowledge results, in essence, from analyzing declarative knowledge (i.e. substantive law principles) as it applies to a particular fact setting.

There are significant hurdles to be overcome in order to embed successful KM in the law firm context, all of which may be categorized according to firm culture: individuality, time, success and lack of incentives (Terrett, 1998). Individuality is encouraged in most law firms; lawyers are not noted for their team-based approaches to legal work or for their willingness to share their expertise. Time is money in a law firm; any time spent sharing knowledge and experience is time not spent billing. Success can be the enemy of innovation; many larger law firms have done very well without any recourse to KM or even particularly innovative use of IT. And lack of incentives obscures the existence of a knowledge marketplace (Terrett, 1998).

Treating law firms as KM setting seems to make sense (Lamb, 1999). IT used to support KM may

well revolutionize law firms (Whitfield-Jones, 1999), as effective IT support for KM can serve as a competitive advantage and as a valuable professional aid to law firms.

Knowledge Networks

The term network has become the vogue in describing contemporary organizational arrangements (Nohria, 1992). While it may be true, from a network perspective at least, that every market may be considered a network and that no business is an island, firms increasingly adopt a network organization. In this case, the notion of a network refers to an organizational form with distinct structural properties, regardless of whether it is considered to be an intermediary form between or beyond markets and hierarchies (Sydow and Windeler, 1998). According to Easton (1992), one approach to networks is to regard them as aggregations of relationships. Most cooperative inter-organizational relationships among strangers emerge incrementally and begin with small, informal deals that initially require little reliance on trust because they involve little risk (Ring and Van de Ven, 1994).

A knowledge network can be defined as a group of persons and activities that cooperates and exchanges information. Seufert *et al.* (1999) use the term knowledge networking to signify a number of people, resources and relationships among them, who are assembled in order to accumulate and use knowledge primarily by means of knowledge creation and transfer processes, for the purpose of creating value. According to Palmer and Richards (1999), learning will in the future take place in knowledge networks rather than within organizations. This is supported by both Kraatz (1998), who found that networks can promote learning, and by Larsson *et al.* (1998), who found different strategies of learning in knowledge networks.

According to the research literature, trust seems to be the most dominating facilitator of inter-organizational knowledge exchange (Cummings and Bromiley, 1996; Grandori and Soda, 1995; Hansen, 1999; Nahapiet and Ghoshal, 1998; Wathne *et al.*, 1996; Aadne *et al.*, 1996). Trust may be defined as the confidence in the goodwill of others (Ring and Van de Ven, 1994).

A knowledge network may require the support of a technical infrastructure, a communications network and a set of information services, i.e. an information architecture. The information and communication system provides partners with the ability to directly communicate with each

other (Monge *et al.*, 1998). Information systems have long been considered important vertical integration mechanisms within firms; more recently they have come to be seen as powerful horizontal integrators for managing interdependence between firms (Grandori and Soda, 1995). Grandori and Soda (1995) further claim that IT networks deserve a place among inter-organizational coordination mechanisms. Their contention is based, first on the spectacular cost reduction in communication the networks bring about, which thereby support many forms of wide-spread network use otherwise hardly feasible; second, because IT networks may be employed as a stand-alone coordination mechanism — based on machines rather than on human or organizational means — in an inter-firm relationship.

One advantage of knowledge networks among law firms is that they share a common language (Nahapiet and Ghoshal, 1998). According to the

Wall Street Journal Europe (1999), law firms look to join forces. Alliances between law firms are motivated by the increase in cross-border business, and networks help law firms go global. In Norway, the local, well-established law firms feel threatened by international law firms which often are involved in both auditing and consulting and which seem to be advanced in their IT support for knowledge management (DN, 1999). Local law firms response is increased use of IT and search for membership in knowledge networks. It is believed that information-technology-enabled partnerships between law firms in their core business activity of legal advice will strengthen their competitive position.

RESEARCH MODEL AND HYPOTHESES

Based on the reviewed literature, the research model in Figure 1 and three research hypotheses

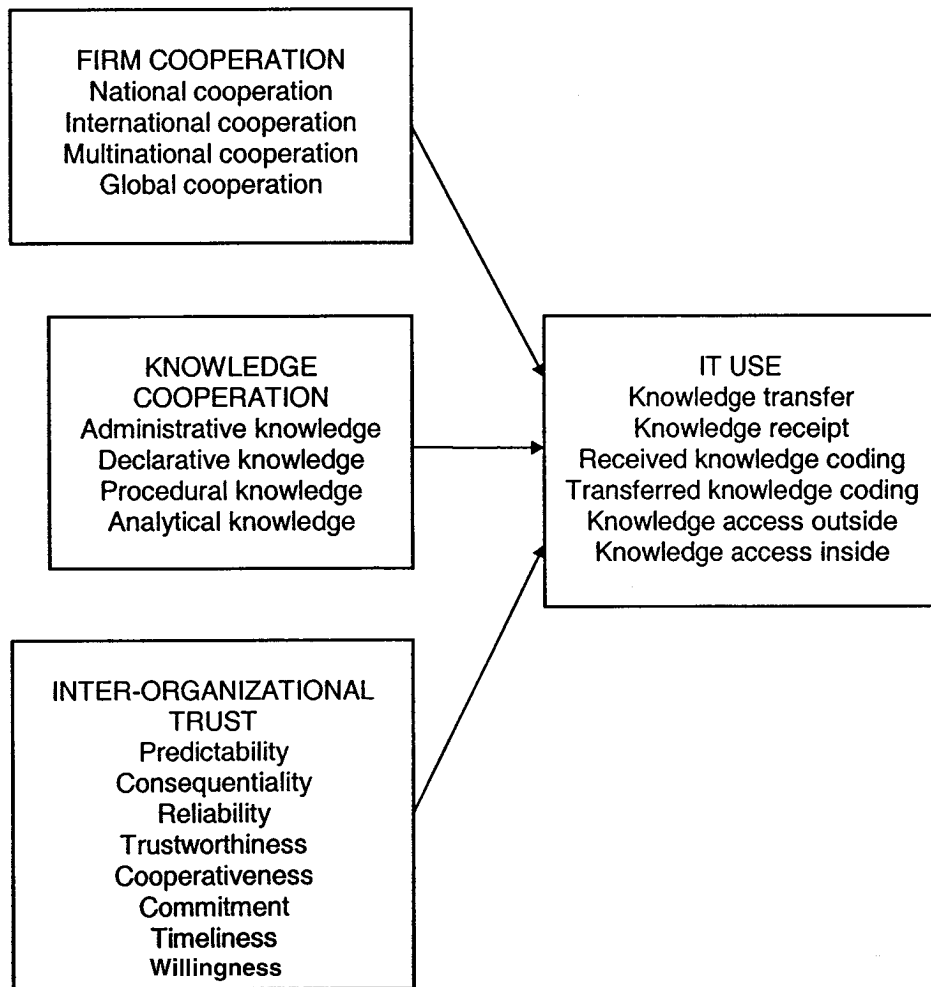


Figure 1 Inter-organizational research model



were developed. First, law firms that cooperate more extensively with other law firms will use IT more extensively to share knowledge with other law firms. Firm cooperation can take on many forms, such as case-based in Norway, case-based internationally, and national and/or global networks. Recent developments in technology have considerably increased the opportunities for knowledge combination and exchange (Nahapiet and Ghoshal, 1998). Information and communication systems provide the ability of partners to directly communicate with each other (Monge *et al.*, 1998). Second, knowledge networks between law firms will be supported by IT (Grandori and Soda, 1995; Monge *et al.*, 1998). Third, inter-organizational trust influences the extent of inter-firm knowledge cooperation. The willingness to provide different types of knowledge is partly determined by trust (Aadne *et al.*, 1996; Wathne *et al.*, 1996). Trust also influences the choice of contacts (Nahapiet and Ghoshal, 1998). Hence,

Hypothesis 1: The greater the extent of firm cooperation between law firms, the greater the extent of information technology use to support inter-organizational knowledge management.

Hypothesis 2: The greater the extent of knowledge cooperation between law firms, the greater the extent of information technology use to support inter-organizational knowledge management.

Hypothesis 3: The greater the extent of trust between law firms, the greater the extent of information technology use to support inter-organizational knowledge management.

RESEARCH METHOD

The sample was composed of 247 law firms in Norway. The desired informants in this research were lawyers with special interest or responsibility for IT. Out of 247 questionnaires mailed, 90 were returned, providing a response rate of 37%. On average, the responding law firms had ten lawyers, and the respondent had been in the firm for ten years.

Four multiple-item scales were used to measure the constructs, one for the dependent variable and three for independent variables as listed in Table 1. They all have acceptable reliability. Table 2 contains descriptive statistics and correlations between study variables. Conservative tolerance

values for collinearity and multicollinearity were not exceeded, and the highest VIF value in the sample was 1.24. Principal component analysis was applied to extract three factors from the twenty-two independent items. Twenty items loaded on the pre-specified factors, and no items loaded significantly on any other factors.

RESEARCH RESULTS

The hypothesis testing was carried out using multiple regression. Table 3 lists the results of multiple regression analysis between the three independent variables and the dependent variable. The full multiple regression between three independent variables explained 68% of the variation in use of IT to support KM, that is, the adjusted *R*-square was 0.68. With an *F*-value of 48, the multiple-regression equation was significant. Two predictors of IT use, firm cooperation and knowledge cooperation, were significant.

The extent of law firm cooperation had a significant impact on IT use to support inter-organizational knowledge management. Law firm cooperation may take place at the national, international, multinational and global levels. The extent of knowledge cooperation had the strongest significant impact on IT use to support inter-organizational knowledge management. Knowledge cooperation is concerned with the sharing of administrative knowledge, declarative knowledge, procedural knowledge and analytical knowledge. Finally, the extent of inter-organizational trust did not have any significant impact on IT use to support inter-organizational knowledge management. It is interesting to note that the average level of trust between law firms is relatively high (3.79) with a relatively low standard deviation (0.64).

DISCUSSION

It seems that inter-organizational knowledge management is at an early stage in Norwegian law firms as indicated by the low mean scores in Table 2. To the extent inter-organizational knowledge management takes place among law firms, information technology is used to a limited extent, achieving an average score of 2.39 on a scale from 1 (low) to 6 (high). Although inter-organizational trust was not a significant predictor, it is interesting to note that the average trust is relatively high.

This study seems to support the discussion by Ring and Van de Ven (1994) concerning

Table 1. Reliability of multiple-item scales

Construct	Measurement of construct	Alpha
<i>IT Use</i> (Ruggles, 1998)	Knowledge transfer Knowledge receipt Received knowledge coding Transferred knowledge coding Knowledge access outside Knowledge access inside	0.97
<i>Firm Cooperation</i> (Grandori and Soda, 1995; Hansen, 1999; Nahapiet and Ghoshal, 1998)	National Norwegian case-based National foreign case-based International case-based Multinational case-based Global case-based National network International network Multinational network Global network	0.87
<i>Knowledge Cooperation</i> (Edwards and Mahling, 1997)	Administrative knowledge Declarative knowledge Procedural knowledge Analytical knowledge	0.93
<i>Inter-organizational Trust</i> (Cummings and Bromiley, 1996; Ring and Van de Ven, 1994; Wathne <i>et al.</i> , 1996)	Predictability Consequentiality Reliability Trustworthiness Cooperativeness Commitment Timeliness Willingness Dependability	0.81

inter-organizational relationships. They argue that most cooperative inter-organizational relationships among strangers emerge incrementally and begin with small, informal deals that initially require little reliance on trust because they involve little risk.

Very few Norwegian law firms seem to be involved in knowledge networks as defined by Sydow and Windeler (1998), who argue that the notion of a network refers to an organizational form with distinct structural properties. Only a few law firms are nodes in networks such as Eurojuris, Lex Norvegica, American Law Firm

Association (ALFA), Proteus, and Multilaw. The largest number of respondents indicating one network, were Eurojuris firms.

Information was collected on software and systems used to support inter-organizational knowledge management in law firms. As seen in Table 4, the firms responses indicate that word processing was the dominant software, followed by electronic mail and external legal databases. A separate column reflects reports from those law firms that scored more than three on the IT support scale. IT-intensive law firms were identified to investigate changes in technology use as

Table 2. Descriptive statistics and correlations

Variable	Mean	s.d.	1	2	3	4
1 IT Use	2.39	1.52	(0.97)			
2 Firm Cooperation	1.82	0.94	0.70**	(0.87)		
3 Knowledge Cooperation	2.42	1.30	0.71**	0.39**	(0.93)	
4 Inter-organizational Trust	3.79	0.64	0.16	0.18	0.27*	(0.81)

Note: The statistical significance of the *t*-values is ** for $p < 0.01$ and * for $p < 0.05$; $N = 79$.



Table 3. Multiple regression between use of IT and predictors

Predictors	Beta	t-test
Firm Cooperation	0.496	6.594**
Knowledge Cooperation	0.525	6.859**
Inter-organizational Trust	-0.054	-0.747

Note: The statistical significance of the *t*-values is ** for $p < 0.01$.

law firms mature regarding their IT applications. When the two columns in Table 4 are compared, IT-intensive law firms seem to have a relatively more extensive use of electronic mail and internal databases.

Four types of information-technology-enabled inter-organizational partnerships have been identified in the research literature: transaction processing, inventory movement, process linkage, and knowledge linkage (Alavi *et al.*, 1997). When classifying the different software products and systems in Table 4, both transaction processing and inventory movement seem irrelevant for law firms. Process linkage (P) and knowledge linkage (K) seem relevant. In Table 4, high-usage software and systems may be classified as both P (ranks 1, 4, 5 and 7) and K (ranks 2, 3, 6 and 8). Process and knowledge classification were introduced here to investigate maturity, as Alavi *et al.* (1997) claim that K is the most advanced form of partnership. Table 4 illustrates that IT provides limited support for the advanced form.

The strong relationship found between firm and knowledge cooperation, on the one hand, and use of IT, on the other, provides strong support for Grandori and Soda's (1995) suggestion that information systems can be powerful horizontal integrators for managing interdependence between firms. They claim that IT networks deserve a place among inter-organizational coordination mechanisms, first because of the spectacular cost reduction they bring about, and second, because IT networks may be employed as a stand-alone coordination mechanism.

Aadne *et al.* (1996) found that the willingness to provide different types of knowledge and information to other firms is often determined by inter-organizational trust. A separate, simple regression between inter-organizational trust and knowledge cooperation did not, however, confirm their finding. This is surprising, since trust seems to be the most frequently mentioned facilitator of inter-organizational knowledge exchange in the research literature (Cummings and Bromley, 1996; Grandori and Soda, 1995; Nahapiet and Ghoshal, 1998).

The software and systems items in Table 4 represent the extent to which each of them are used for inter-organizational knowledge management. Treated as statistical items, they all load on one factor with a reliability of 0.85. This measurement scale represents an alternative dependent variable. To predict the extent of software and systems use, the same three independent variables were used. The regression equation was

Table 4. IT support for inter-organizational knowledge management

Software and systems used by law firms	P/K	All law firms	IT-intensive law firms
Word processing (e.g. Word)	P	5.0	5.5
Electronic mail (e.g. Outlook)	K	3.8	5.8
External legal databases (e.g. law base)	K	3.4	4.3
Spreadsheets (e.g. Excel)	P	3.0	4.2
Internal databases (e.g. standards)	P	3.0	4.5
Other external databases (e.g. property)	K	2.2	3.0
Accounting systems (e.g. IFS)	P	2.0	2.5
Presentations (e.g. Powerpoint)	K	2.0	3.0
Others things on Internet	K	2.0	3.0
Other firms' web pages on internet	K	2.0	3.1
Other office products (e.g. Access)	P	1.9	2.3
Groupware (e.g. Lotus Notes)	K	1.9	3.8
Law firm's own web pages on Internet	K	1.9	3.7
Law firm's own extranet	K	1.7	1.8
Library system (e.g. Bibjure)	K	1.6	1.9
Law firm's own intranet	K	1.5	2.5
Document systems (e.g. Jasper)	P	1.4	1.5
Expert systems (e.g. artificial intelligence)	K	1.3	1.7
Other law firms' web pages on extranet	K	1.3	1.7

significant, explaining 16% of the variation in software and systems use. This time, only knowledge cooperation was a significant predictor. Compared with the previous regression, this supplementary regression confirms the dependence of IT use on knowledge cooperation, rather than firm cooperation or inter-organizational trust.

FUTURE RESEARCH

Several suggestions for future research are relevant based on concerns of the current study. First, the theoretical framework guiding this research should be improved. Knowledge is not something that is out there which can be stored in a container (knowledge management systems). Rather, knowledge is something that is embedded in social relationships and everyday activities. A clear distinction can be made between knowledge management and knowledge management systems, and a clear distinction should also be made between intra-organizational knowledge management systems and inter-organizational knowledge management systems. The essential theoretical issues should be isolated and distilled in future research. An improved theoretical framework will provide stronger support for current and revised research hypotheses.

Second, key constructs should be explored. The whole literature on technology acceptance and social influence in technology adoption process will prove helpful. More evidence should be provided for the reliability and validity of the measures used. The different kinds of knowledge (e.g. procedural, declarative etc.) should be further explored in future research.

Third, methodology concerns should be overcome in future research. The research is about an organizational level phenomenon, and multiple firms may be considered a necessary condition for testing a between-organization relationship.

CONCLUSION

This paper has explored some important and contemporary issues concerning knowledge management by viewing organizations as knowledge systems. Studying law firms can produce many useful insights on how organizations and individuals are managing their knowledge, as these firms are knowledge intensive — and almost entirely knowledge based — organizations. More empirical research is needed in the knowledge management field, and this paper reported

empirical results from Norwegian law firms on their use of IT to support their knowledge management practice. IT plays a critical role in inter-firm knowledge management efforts.

The inter-organizational study documents that the extent of law firm cooperation and the extent of knowledge cooperation had a significant impact on the use of IT to support inter-organizational knowledge management. The extent of inter-organizational trust did not have any significant impact.

This research has made a contribution to the knowledge-based view of the firm applied to professional service firms. It is suggested that future research focus on two in-depth perspectives of the current research. First, work processes in which law firms cooperate should be pursued. Second, the role of specific technologies in inter-organizational knowledge management should be investigated. In addition, future research should attempt to improve instruments to measure constructs in this research.

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