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USING NETWORKS FOR CHANGING INNOVATION STRATEGY: THE CASE OF IBM

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ABSTRACT

Large-scale strategic change projects in companies may be supported by using alliance networks. This paper shows that IBM's change from an exploitation strategy towards an exploration strategy required a radically different network strategy as well. By entering into more non-equity alliances, involving new partners in the network and loosening the ties with existing partners, IBM supported its transformation from a hardware manufacturing company to a global service provider and software company.

KEY WORDS

Networks, innovation, strategic change, exploration/exploitation, IBM.

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INTRODUCTION

Strategic change is often seen as something internal to the firm. This paper proposes that external relations in a company's alliance network can be used in strategic change processes as well. The IBM case is used to prove this point. The paper shows that exploration strategies, aimed at innovating and business development, and exploitation strategies, aimed at making the most of existing competences, require different network structures. Network behaviour aimed at exploitation is compared to network behaviour aimed at exploration in the case of IBM. The conclusion is that the networks for these two objectives differ substantially and that IBM has consciously used its network to support its strategic change project.

STRATEGIC CHANGE: EXPLORATION AND EXPLOITATION

Strategic change is often considered as a necessity for companies to survive in a turbulent environment (Hamel and Prahalad 1994). Intense international competition and rapid technological change are often mentioned as primary motives for companies to adapt their corporate strategy (Christensen 1998; Eisenhardt and Tarbizi 1995; Sadowski et al. 2003). One way of facilitating strategic change is to engage in alliances for the exploration of new capabilities and the exploitation of the existing knowledge base of the corporation (March 1991). Alliances are a means of learning from alliance partners (Kale et al. 2000; Khanna et al. 1998). The process of learning boils down to the exchange of technological knowledge or capabilities. Technological capabilities are the accumulated technical skills and know-how in an organization.

In order to come up with a more refined view on learning, we will make use of March's (1991) seminal distinction between exploitative and explorative learning. Exploitation is generally associated with the refinement and extension of existing technologies. Exploration on the other hand deals with experimentation with new alternatives and the exploration of a new (technological) field. In this paper we argue that there are important differences between both types of learning (March, 1991; Chesbrough, 2003), which significantly affect the way in which companies make use of their external technology networks.

EXPLORATION AND EXPLOITATION: THE IMPACT ON NETWORKS

As suggested above, exploration and exploitation strategies are not just internal to the firm. Alliance networks are often used to support these strategies. In spite of the vast body of literature on strategic technology alliances, only very few papers focus particularly on the use of networks for exploitative or explorative learning (for exceptions see e.g. Ahuja and Lampert, 2001; Hagedoorn and Duysters, 2002; Rowley et al., 2000). There is consensus in these few contributions that firms pursuing a strategy of exploration for product development are most likely to establish alliances that are characterized by 'weak ties' (Granovetter 1973). 'Weak ties' in this context mean that companies exhibit low commitment to their alliances and team-up with non-familiar partners. When exploring a particular new technology, companies may not want to enter into inflexible forms of alliances, because they do not know whether the technology will prove to be useful to them.

They want to have the opportunity to abandon the alliance at any given moment (Duysters and De Man, 2003). Strong ties, characterized by intimate, recurrent and trustful relationships, on the other hand are helpful with an exploitation strategy (Krackhardt 1992). In order to exploit knowledge and make the most of established technologies and products intensive relation with partners are a prerequisite. Exploitation requires intensive knowledge exchange and creating economies of scale. Both can be achieved in strong ties and much less so in weak ties, because only strong ties have the requisite intensity for this. Hence, exploration strategies lead to lower-commitment R&D alliances in new technological capabilities, since the focus is on learning new ideas from new partners. Exploitation strategies on the other hand will lead to high-commitment alliances in existing technological capabilities (Koza and Lewin 1998). In the literature we find some scattered empirical evidence on this matter. Hansen et al. (2001), Afuah (2000) and Rowley et al. (2000) found strong evidence that the value of strong and weak ties depends on the type of learning and the external environment. Rowley et al. (2000) showed that strong ties are particularly effective for exploitation purposes and less for effective for exploration. The need for weak ties has been shown to be particularly high under conditions of rapid technological change where the need for explorative learning is highest (Afuah, 2000).

Table 1: Network characteristics for exploration and exploitation strategies

	Exploration	Exploitation
Alliance type	Non-equity alliances; few equity alliances	Relatively high number of equity alliances
Speed of changes of partners	Higher: many new partners enter the network	Lower: few new partners enter the network
Type of partner capabilities	Partners with the similar technologies	Partners inside current business

Empirically, exploration networks differ from exploitation networks in three observable ways (see Table 1). First, exploration networks will make use of flexible legal structures, whereas exploitation alliances will use legal structures that enable long-term collaboration. Exploration networks therefore have a preference for non-equity alliances, whereas exploitation networks will have a larger proportion of equity alliances in them (Koza and Lewin 1998). Joint development agreements (JDA) and joint research pacts (JRP) are non-equity agreements with lower levels of commitment. Agreements with a high level of commitment are equity-based relations like joint ventures (JV). A measure for the extent to which a network shifts towards an exploration strategy is obtained by counting these alliance types across different time periods.

Second, in exploration networks partner turnover will be higher than in exploitation alliances. Companies pursuing exploration strategies will change their partners more often. Comparing the composition of a network in period t with the network composition in t+1, will show that the proportion of new partners in an exploration network is higher than the proportion of new partners in an exploitation network. Exploration requires access to a diversity of knowledge and a continuous scanning of new technological opportunities. As these opportunities often arise outside existing partners, partner turnover will be high. Exploitation requires intense collaboration. This takes time to build up and benefits will accrue only after long-term collaboration. Consequently, exploitation networks will have a higher proportion of the same partners over time than exploration networks.

A third measurable characteristic of networks that differs between exploitation and exploration strategies relates to partner capabilities. In exploration networks companies will look for partners with capabilities outside their existing business. In exploitation networks companies will tend to look for companies with similar technological knowledge. Exploration strategies lead to an innovation network consisting of partners in new technological areas. Exploitation strategies on the other hand will lead to an innovation network of partners in similar technological areas.

To find out whether companies actually use and adapt their network when entering a period of strategic change, these network measures will next be studied for the IBM case. In the 1990s IBM went through a major reorganization, changing from an exploitation strategy towards an exploration strategy. This makes IBM exceptionally well suited to observe whether the IBM network changed accordingly,

using the network measures as stated in Table 1. This will be investigated below using the MERIT-CATI database of strategic technology alliances, as discussed in more detail in Hagedoorn and Schakenraad (1992), and the CGCP database of strategic technology alliances.[3]

BRIEF HISTORY OF IBM

The history of IBM starts with the history of a few other companies with competencies in different mechanical fields. Computing Tabulating Machines (CTR) was formed in 1911 via a merger of International Time Recording Company, Computing Scale Company and the Tabulating Machines Company.[4] In 1914, Thomas J. Watson Sr. joined the company to become general manager and CTR was renamed International Business Machines (IBM) in 1924. IBM's business machines consisted of a large variety of commercial products, everything from scales and cheese slicers to clocks and typewriters (Gerstner 2002). Watson's patriarchal leadership and personal philosophies defined IBM's culture. Nonetheless, it was his son Tom Watson Jr., succeeding his father as CEO in 1956, who led IBM into the digital computer age. This was a major turnaround for the company (Gerstner 2002).

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[3] The CGCP database is used as a complementary database for the period 2001-2002, for which the data were not available in the MERIT-CATI database. The data collection method of the CGCP database is similar to the MERIT-CATI database. For a description of the CGCP database, see http://www.cgcpmaps.com.

[4] Source: "A century of innovation", a Flash presentation of IBM's history, downloaded from http://www.ibm.com in June 2002.

Under the leadership of Watson Jr., in 1964 IBM announced its most important product to date, System/360, which was the original name of IBM's "family" of mainframe computers.[5] System/360 in the 1960s and 1970s was as revolutionary as Windows was to Microsoft in the 1980s and 1990s. The comparison between these two companies is appropriate since both IBM and Microsoft benefited from major technological shifts and brought entirely new capabilities for customers to the market (Gerstner 2002: 114). For IBM the integrated circuit was the most important technology shift, though the circuit had been invented elsewhere. This invention made computers significantly smaller, more reliable and cheaper, making mainframe computers available for a large group of customers. Up to that moment, computers were based on proprietary technologies, but since System/360 was a family of computers – from very small to very large processors – customers could easily make upgrades when needed and software developed for one processor would run on any System/360 processor. In addition, peripheral equipment could run on any processor of the family. In short, System/360 was the ideal system for customers. On IBM's competitors, however, the introduction had a devastating effect (Gerstner 2002).

Until the early 1980s, IBM was probably the best example of a vertically integrated corporation: almost all stages of design, production and commercialization of computers remained internal to the firm (Ernst 2003). This was true for semiconductors, hardware, operating systems, application software, and sales and distribution. IBM was the world leader in computer manufacturing and it seemed that the company's leadership position would remain unchallenged for many years

[5] Ibidem.

to come. IBM was one of the pioneers in mainframe computers and still is one of the world's largest providers of computer hardware. The company manufactures a broad range of computers, including personal computers, notebooks, mainframe computers and network servers.

Since the position of IBM had been unchallenged for so many years, the company had not developed sophisticated strategies to cope with fierce competition. In the advent of the "next big thing", which was the rise of UNIX rather than personal computing, IBM was under serious attack. UNIX was an "open" operating system, supported by Sun and Hewlett-Packard, which offered customers the first attractive alternative to IBM's mainframe computers (Gerstner 2002). In addition, IBM failed to see that personal computers (PCs) would be widely used by business and enterprises, so the PC market was not a high priority to IBM. PCs were not thought of as a major challenge to IBM core enterprise computing market. IBM gave control over the operating system to Microsoft and the microprocessor to Intel and in the early nineties IBM's leadership position started to crumble. Fujitsu, Digital Equipment and Compaq were the competitors for hardware components and were catching up fast. EDS and Andersen Consulting were gaining ground in information services, while Intel and Microsoft were more profitable in the PC market than IBM at that time (Hamel 2000). The once so comfortable position of "Big Blue" was fading away at a very rapid pace. In April 1993, Louis Gerstner was appointed as CEO and he had the difficult task to transform IBM in such a way that it could regain its competitive position.

STRATEGY CHANGE OF IBM: ENTERING THE INTERNET ERA

Two forces that emerged in the computer industry in the early 1990s were decisive for IBM's strategic change (Gerstner 2002: 125). The first force, system integration, emanated from customers. Customers increasingly valued companies that could provide solutions integrating technology into the processes of enterprises. Because of this customer-driven force, IBM saw that in time the ICT industry would be service-led rather than a technology-led. The second force was the emergence of the networked model of computing that would replace the stand-alone PCs that dominated the market in the beginning of the 1990s. The PC would be one of the networking devices, but the management of free-flowing digital information would be done on large-scale systems rather than desktop computers. Thus, computing infrastructure and software would have the future. It was only logical that IBM had to turn its attention toward services and software, and in addition the company decided to sell and license leading-edge technology to its competitors, which helped Big Blue back in the saddle (Gerstner 2002: 149).

Hamel (2000) provides an illustration of the strategic change that helped IBM transform from a hardware manufacturer into a dominant service provider. The major change that took place in the mid-nineties was brought about by a few visionary individuals at IBM who discovered the Internet as a potential source of future revenues. This small group of believers developed an Internet strategy for the corporation as a whole.

An important initiative to help IBM catch the Internet wave was undertaken by David Grossman, a computer programmer who was one of the first to download the Mosaic browser and explore the Internet (Hamel 2000). To his surprise, IBM had zero presence on the Web while competitors such as Sun-Microsystems and Hewlett-Packard had already set-up websites and used them actively. IBM was the main sponsor of the Winter Olympics, but it was Sun that used IBM-generated up-to-date scores and other data. These were presented on television and on their Winter Olympics website. Many people thought that Sun was the main sponsor instead of IBM. Grossman managed to convince John Patrick, an IBM strategist, and eventually IBM's CEO Gerstner, that IBM needed to "get connected" (Hamel 2000).

Grossman and Patrick formed an Internet group, which hired employees from divisions across IBM bundling all Web technology that people had been working on in the company. The first showcases came in 1994 with IBM's Global Network, as the world' s largest Internet Service provider, and a Web browser that preceded Netscape's Navigator and Microsoft's Explorer. For the 1996 Summer Olympics the Internet group developed a website with an extensive scoring database attached to it and the possibility for on-line sales of tickets. The Web server software developed for the Summer Olympics evolved into a product called Websphere, which formed the basis for IBM's Web-hosting business of today (Hamel 2000). Palissano, Gerstner's successor, took the e-business even further, using a different strategy. He successfully made IBM's organization flatter and more flexible, which enabled the company to adapt more quickly and more adequately to a rapidly changing competitive environment.

In short, before Gerstner initiated IBM's strategy change, IBM followed an exploitation strategy. This is evident from the fact that there was a strong focus on the internal development of hardware and software in existing expertise areas of mainframe computers and PowerPC's. After Gerstner's strategy change, IBM followed an exploration strategy. This is evident from the fact that IBM was willing to sell and share technology in exchange of know-how in new areas of software and service development. Whether this change went with a change in IBM's network, will now be researched.

DATA AND SAMPLE

Whether IBM's alliance network supported its move from an exploitation strategy towards an exploration strategy is researched by means of looking at the network composition in three pairs of years with three year intervals: 1991/1992, 1996/1997, 2001/2002. The predictions based on Table 1 are that over time, IBM starts to make relatively more use of non-equity alliances, increases the number of new partners in its network and looks for an increasing number of partners outside its 1991/1992 core business. The method is based on event analysis, by singling out a period of strategic change and taking snapshots of the IBM network before, during and after that period. This method of repeated observation around an event aims to increase our understanding of network change, by combining qualitative with quantitative analysis.

These predictions are tested by using alliance data from the MERIT-CATI database and the CGCP database, which tracks alliance activity over the period covering our study. The databases register the partners, their industry and the type of alliances and thus contains all relevant information. The periods are chosen because they represent three time periods relevant for IBM's strategic change. In 1991/1992 IBM had an exploitation strategy. In 2001/2002 the effects of the strategic change towards an exploration strategy should have materialized. The years 1996/1997 are years in which the first effects of the strategic change initiated by Gerstner should have become visible. Gerstner started in 1993 as CEO of IBM and he took some time to formulate the new strategy. Next, it takes about one or two years before an alliance is set up, negotiated and announced, so that 1996 will be the first year in which the strategic change could be discernible in IBM's alliance network. Pairs of years are used, rather than individual years, in order to obtain a reasonable amount of alliances for our study.

Alliance agreements can take a variety of forms, with a wide range in the level of commitment. Alliance agreements include (cross-) licensing agreements, customer-supplier contracts and standard-setting agreements. Since this is a study on innovation networks, the alliance that are of particular relevance are those that involve joint research and development or other forms of technology sharing (Koza and Lewin 1998). We therefore study joint development agreements (JDA), joint research pacts (JRP) and research joint ventures (JV).

IBM is historically by far the most active in alliance formation among its peer group. The company has had more alliances than any other company in the ICT domain:

384 alliances with 227 different partners in the period of 1985 to 2002. These numbers are higher by far than any other company in the sample, which makes IBM an interesting case for further investigation.

THE IBM NETWORK: 1991-2002

In this section, we will investigate how networking strategies facilitated the business transformation of IBM initiated by Gerstner. In order to do this, the networking strategies of the early nineties, before Gerstner's arrival in 1993, are compared with the networking strategies in the mid-nineties and the beginning of the 21st century.

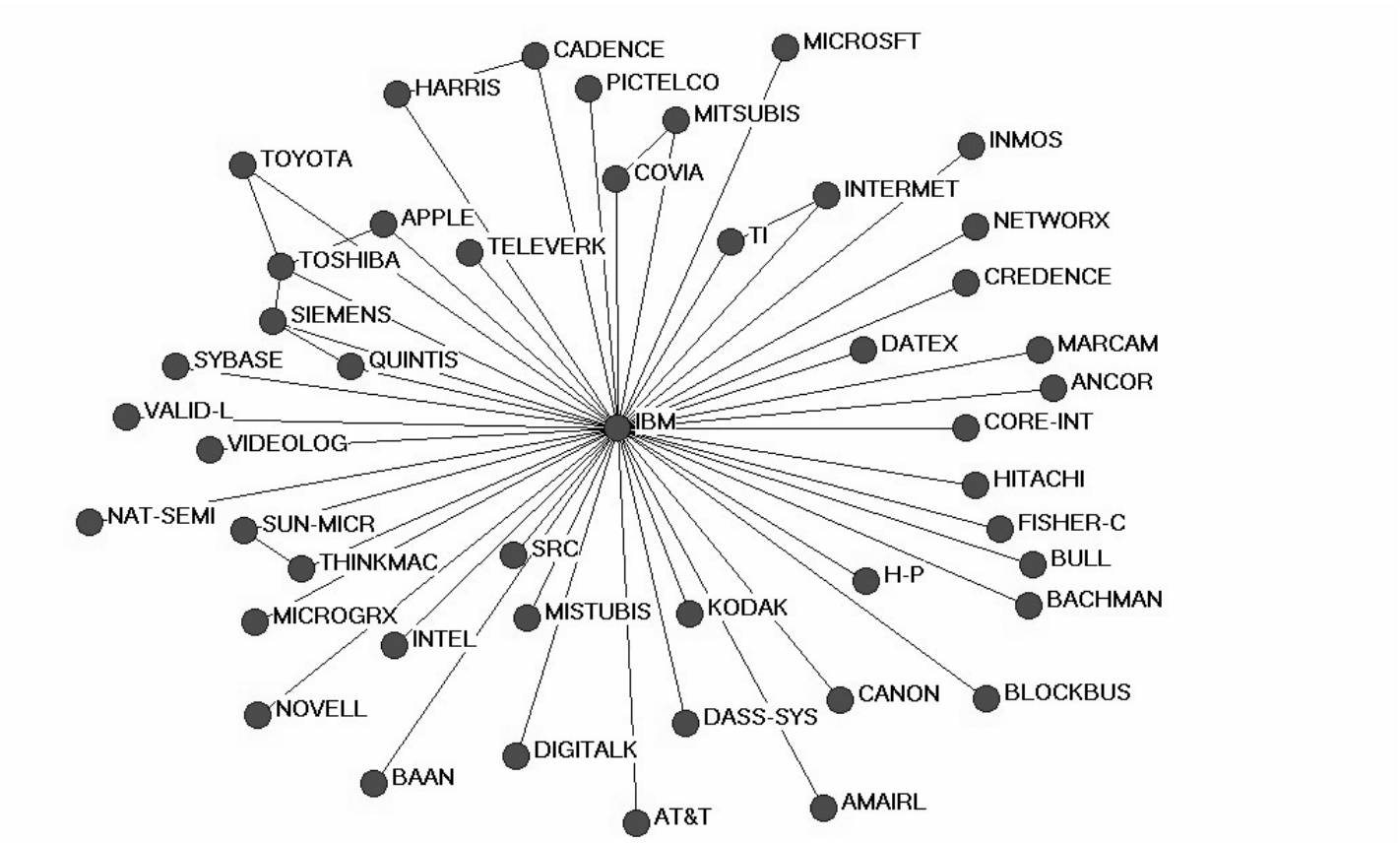
Most activities that characterized IBM in the late eighties and early nineties have been gradually farmed out to multiple layers of specialized suppliers, giving rise to rapid market segmentation and an ever-finer specialization. This has given rise to the co-existence of complex, globally organized product- specific value chains (e.g., for microprocessors, memories, board assembly, PCs, networking equipment, operating systems, applications software, and sales & distribution). An important initial catalyst of vertical specialization was the availability of standard components, which allowed for a change in computer design away from the centralized IBM mainframe to decentralized architectures, PC and PC-related networks (see e.g. Langlois, 1992).

In order to see the significance of the overall corporate strategy change at IBM, the network embeddedness of IBM in the period before Gerstner's appointment is compared with the period after that. In the period 1991-1992 IBM engaged in 55

alliances, 42 of which were joint development agreements and joint research pacts, nine were joint ventures and research consortia and two cross-licensing agreements (see Figure 1). From those 55 strategic alliances, 23 were in the field of computer manufacturing, mainly in the development of microprocessors, and 23 in the field of software development, mostly related to operating systems and software architecture. IBM had two important alliances with Microsoft and Intel. Microsoft and IBM cross-licensed Windows New Technology and with Intel, IBM had a long-term agreement on the development of microprocessors. This latter agreement had a time horizon of 11 years, but was terminated in 1993. The two agreements confirm IBM's choice for the so-called Wintel personal computers.[6] IBM is also active in developing software for third parties. Examples of these types of software development agreements are alliances with airline-companies such as a flight reservation system for American Airlines (AMAIRL) in 1992. IBM is also very active in developing communication networks, such as local area networks. The company, to a lesser extent, is involved in industrial automation, such as CAD/CAM applications.

[6] Wintel is a contraction of Windows and Intel. IBM had set the standard for the PC, Microsoft for the operating system and Intel for the microprocessor.

Figure 1: IBM's innovation network (1991-1992)



Source: MERIT-CATI database

IBM intensively collaborates with personal computer and software developer Apple on many fields of alliances within the ICT domain. The collaboration with Apple seems strange, since IBM and Apple support different and competing basic designs of computing (Hagedoorn et al. 2001). However, in the period 1991-1992 IBM and Apple had ten strategic alliances, mainly related to the development of microprocessors and software architecture. The technology developed in these alliances is mainly related to microprocessors for PowerPCs and mainframe computers, and the development of software, including network software, operating

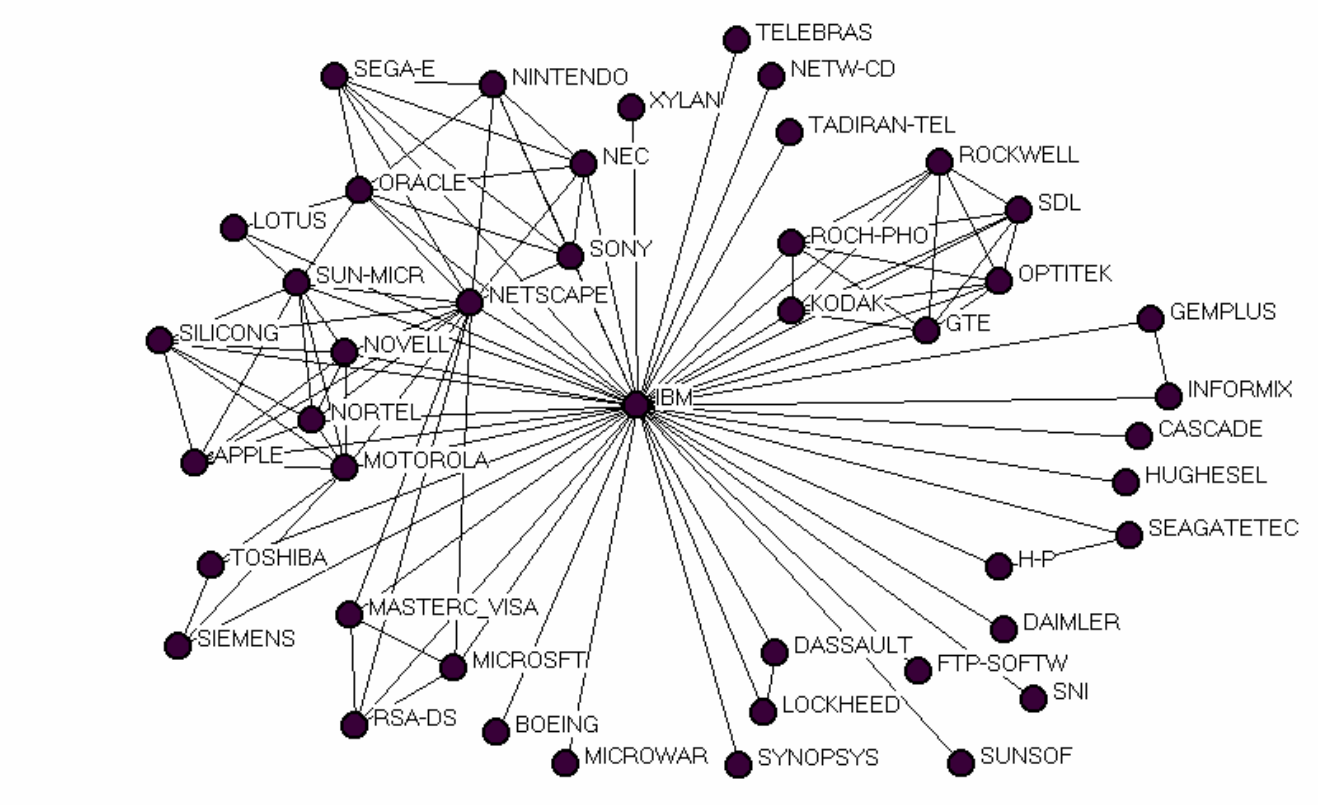
systems and multimedia applications. Though non-equity R&D agreements may indicate exploration of new capabilities (Koza and Lewin 1998), it is clear that IBM and Apple were highly committed (Gulati 1999; Nooteboom 1999; Uzzi 1996, 1997; Walker et al. 1997). The long-term relationship between these two companies indicates a strong tie (Krackhardt 1992) for exploiting technological capabilities in RISC architecture and software. Strategic alliances between IBM and Apple are not reported in the period 1997-2000.

In the period 1996-1997, IBM had 32 strategic alliances, 27 of which were joint development agreements; two were joint ventures, two cross-licensing agreements and standardization agreement. What stands out immediately when comparing this period (Figure 2) with the previous one (Figure 1) is the collaboration with multiple partners and the increased complexity of the network configuration. In the period 1991-1992 most agreements were bilateral, but in the period 1996-1997 there are some large consortia involving many different partners. The multiple partnerships with Toshiba and Motorola are all in developing microchips, one of IBM's core competencies, indicating that IBM is exploiting existing capabilities (March 1991; Walker et al. 1997).

However, more and more of the partnerships in the period 1996-1997 are joint development agreements in relatively new areas of expertise, which indicates that exploration of new technological capabilities is becoming more important to IBM (Khanna et al. 1998; Koza and Lewin 1998; March 1991). This is especially true for joint R&D in the fields of telecommunication (developing switches) and browser software. Along with these relatively new fields, existing technological capabilities

in microelectronics and computing were used for developing microchips and improving PowerPC technology.

Figure 2: IBM's innovation network (1996-1997)



Source: MERIT-CATI database (1996); CGCP database (1997)

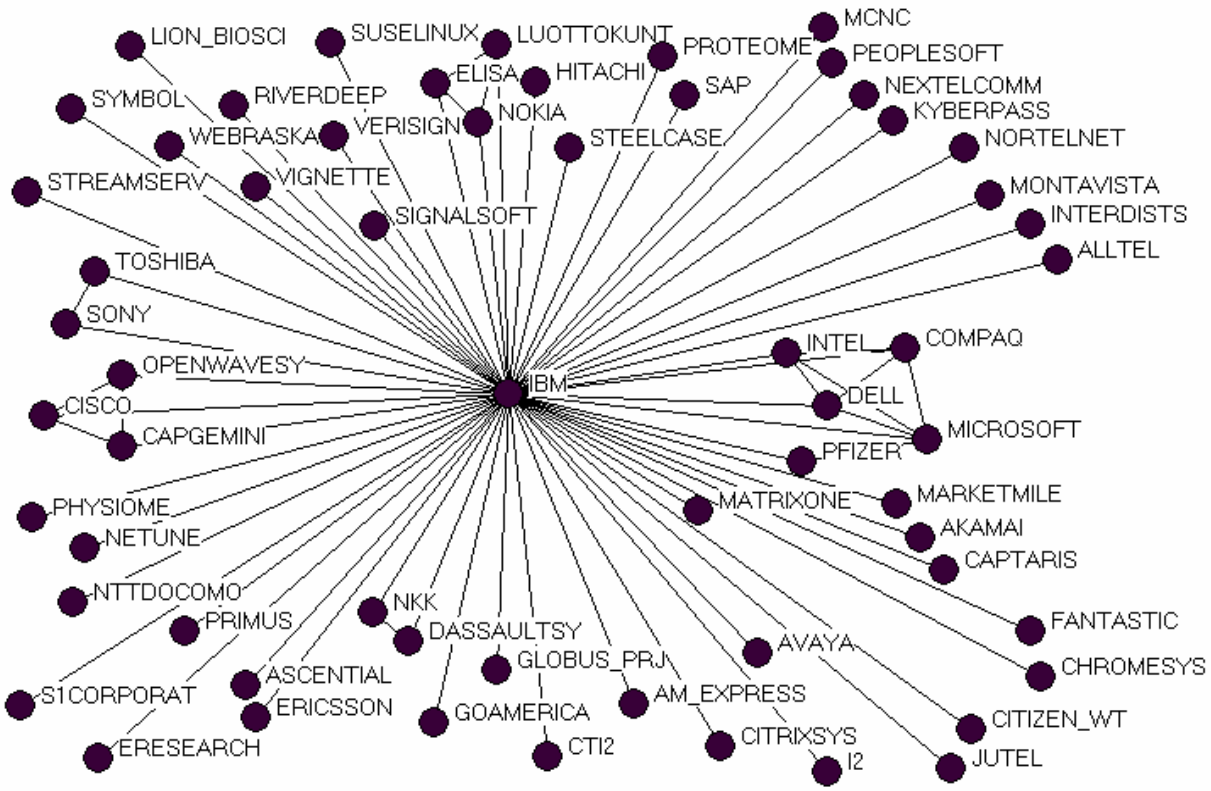
From 1996 onwards it becomes clear that the pioneering work of the Internet group at IBM (Hamel 2000), which has been discussed above, has been mutually reinforced by corporate networking strategies. Before 1996, IBM had no alliance agreement related to the development of Internet-related products or services. In 1996-1997 only 6 out of 32 alliance agreements deal with Internet, one of which is a joint venture with Netscape, Oracle, Sony, Nintendo, Sega Enterprise and NEC. This joint venture was set up for the development of Internet browsing software. From

1996 onwards, Internet-related products and services are becoming more and more important. IBM has gradually employed networking strategies in a variety of Internet-related products and services, based on the products developed by the Internet group such as Internet browsers, ThinkPad, WebSphere and other e-business applications. IBM's core competencies are still in computer hardware and software, but the focus of attention is shifting to Internet and e-business solutions, a field unknown to the company before 1996. Developing these new capabilities clearly indicates an exploration strategy (Khanna et al. 1998; Koza and Lewin 1998; March 1991). So, in a relatively short period of time IBM managed to change from a laggard to a leader in global (Internet) service provision. This has been achieved first through internal organizational transformation and second through a new portfolio of networking strategies.

When comparing the network of alliances of 1996-1997 and 2001-2002, it appears that alliances in computer manufacturing have become less important. In 1996, hardware manufacturers as Motorola and Sun Microsystems were prominent partners of IBM (Figure 2), whereas there are no alliances with these companies in 2001-2002 (Figure 3). On the other hand, alliances on software and telecommunications have become more important. Alliances with Microsoft, Peoplesoft, and Citrix Systems in 2001-2002 (Figure 3), for instance, show that IBM explored a wide variety of software development projects. In the field of telecommunications, IBM has been developing new products with network developers Cisco and Nortel Networks, and leading mobile phone manufactures such as Ericsson, Nokia and NTT DoCoMo in 2001-2002. These collaborations

make IBM a strong partner in telecommunications in North America, Europe and Asia.

Figure 3: IBM's innovation network (2001-2002)



Source: CGCP database

The data presented in Figures 1-3 show that IBM engages mainly in alliances in the fields of computer manufacturing and software development, the company's traditional core competencies, which may lead to the conclusion that IBM has mainly exploited existing capabilities. Frequent partnerships in computer and software development demonstrate that IBM's high level of commitment (Gulati 1999; Krackhardt 1992; Nooteboom 1999; Uzzi 1996, 1997; Walker et al. 1997), in that the company maintains relationships with a select group of partners in a wide

variety of projects over a longer period of time. However, especially in the period 1996-1997 and 2001-2002, IBM establishes more relationships outside its existing technological capabilities. Thus, gradually exploration of new capabilities becomes more important (Khanna et al. 1998; Koza and Lewin 1998; March 1991).

Looking specifically at alliance type, speed of change of partners and the type of capabilities sourced via alliances, Tables 2-4 show numerically what changes in the IBM network took place. First, a change in networking strategies can be seen in a change in the proportion of non-equity versus equity agreements. The first category of agreements is joint development agreements (JDA) and joint research pacts (JRP). These non-equity agreements on joint research and development indicate exploration strategies, as discussed in Koza and Lewin (1998). Equity agreements, such as joint ventures (JV) are usually associated with exploitation (Koza and Lewin 1998). Though the pattern of alliances is rather volatile, both in terms of the number of agreements and in terms of the type of alliance agreements, it becomes clear from Table 2 that equity agreements have become less important in IBM's networking strategies over the last decade. A relatively large proportion of high commitment agreements (JV) and an abundance of license agreements related to microelectronics and computing characterized the period till 1992. After 1992, the proportion of high commitment agreements is decreasing, while the proportion of lower commitment R&D agreements (JDA/JRP) is increasing. In the base period 1985-1990 and 1991-1992, equity agreements had a share of respectively 12 % and 18 % of all alliance agreements. However, in the period 1996-1997 and 2001-2002 these share decreased to respectively 6 % and 5 %. Following Koza and Lewin (1998), this trend indicates that exploration is becoming more important than exploitation after 1991-1992. IBM

has adapted its network to reflect the new strategy of exploration by means of entering into more flexible alliances.

Table 2: Non-equity versus equity agreements

	1985-1990	1991-1992	1996-1997	2001-2002
Non-equity agreements	99 (88 %)	45 (82 %)	30 (94 %)	57 (95 %)
Equity agreements	14 (12 %)	10 (18 %)	2 (6 %)	3 (5 %)

Source: MERIT-CATI database (1985-1996); CGCP database (1997-2000)

Comparing the types of alliance partners in the three innovation networks with each other and with the period 1985-1990, it can be demonstrated that the alliance activities are dominated by a search for new partnerships (Granovetter 1973). Table 3 shows that the share of new partners in the innovation network compared to each of the previous periods is relatively high. In the period 1991-1992, 63 % of the partners were new to IBM, while in the period 1996-1997, the share of new partners is 68 %. Even more remarkable is the high share of new partners of 78 % in 2001-2002. This means that in the innovation network, IBM only collaborated before with 13 out of 59 partners. Moreover, the partners come from a different technological field than IBM's origin. Only few of the frequent partners in hardware manufacturing can be found in Figure 3. Instead, these partners work on client-based software and services. This trend indicates that IBM is becoming more of a service-led company, which again reflects Gerstner's strategy of business transformation towards exploration.

Table 3: New partners in IBM's innovation network

	1985-1990	1991-1992	1996-1997	2001-2002
Number of partners	116	44	44	59
New partners	n.a.	28	30	46
Proportion of new partners	n.a.	63 %	68 %	78 %

Source: MERIT-CATI database (1985-1996); CGCP database (1997-2002)

To get better grips on the technological capabilities that are searched for, all alliances that IBM engaged in are subdivided into six categories: computers, software, Internet, telecommunications, microelectronics and other ICT related activities (Table 4).[7] The focus of attention in strategic technology alliances over the years is rather volatile, but alliances on computer and microelectronics manufacturing, and the development of standard and dedicated software are most common in the period 1985-1992. In the period 1985-1990, half of the agreements were on computer manufacturing and one-quarter on software development. In the period 1991-1992, computer manufacturing and software development have equal shares of 42 % and naturally there were no alliances on Internet applications (see Table 3). However, strategic networking in the development Internet applications, both hardware and software, has become more important. In 1996-1997, 19 % of all alliance agreements deal with Internet applications. But especially in 2001-2002, the proportion of alliance on Internet applications is remarkable with a share of 55 %. In the light of March's (1991) definition, this indicates that IBM's exploring strategies are more dominant in 2001-2002 than its exploitation strategies.

[7] These are categories that are common in the MERIT-CATI and CGCP database. A detailed description of all categories can be found in Duysters and Hagedoorn (1993).

Table 4: Search for capabilities in innovation networks

	1985-1990	1991-1992	1996-1997	2001-2002
Computers	57 (50 %)	23 (42 %)	19 (59 %)	8 (13 %)
Software	28 (25 %)	23 (42 %)	1 (3 %)	10 (17 %)
Internet	0 (0%)	0 (0%)	6 (19 %)	33 (55 %)
Telecommunications	14 (12 %)	4 (7 %)	5 (16 %)	5 (8 %)
Microelectronics	6 (5 %)	2 (4 %)	1 (3 %)	1 (2 %)
Other	9 (8 %)	3 (5 %)	0 (0 %)	3 (5 %)

Source: MERIT-CATI database (1985-1996); CGCP database (1997-2002)

IMPLICATIONS AND CONCLUSIONS

The strategic change project IBM initiated in the 1990s is clearly visible in the changing alliance network. The network reflects a considerable shift in the way IBM shaped its learning strategy with network partners.

The study into IBM's network has a number of implications for management practitioners and researchers. The first implication is that company alliance networks can be used to facilitate strategic change inside a company. Strategic renewal is not just an internal project. It can be stimulated by an active use of the company network. Different strategies require different types of networks. Learning strategies aiming at exploitation require different alliances and alliance partners than learning

strategies aimed at exploitation. To be successful, new company innovation strategies need to be translated into new networks (De Man, 2004).

Second, this strategic change in the network can be brought about by three mechanisms: shifting the balance between equity and non-equity relationships, increasing the speed of change of partners and looking for partners in areas outside the existing competences. IBM has used all three of these techniques to support its new strategic direction. Even though some authors have claimed that networks stimulate innovation (e.g. Chesbrough, 2003; Porter, 1990), the techniques that companies employ for this have rarely been identified. The IBM case not only shows these techniques, it also shows they are employed simultaneously to obtain the full effect. Merely changing partners is not sufficient; the type of relationship with them should change as well, as should the type of partner. From a practitioner's perspective, but also from an academic point of view, these findings are very important because, apart from a few notable exceptions (Ahuja and Lampert, 2001; Hagedoorn and Duysters, 2002; Rowley et al., 2000) the dominant stream of literature on alliances tends to ignore a more in-depth view on various types of learning and the employment of different alliance strategies to accommodate these types of learning.

Third, this study suggests IBM has been able to consciously manage the shift in its network. The alliance literature has paid little attention to change and network dynamics. It seems most of the literature implicitly assumes networks are static entities beyond the influence of individual companies. The IBM case supports the opinion that companies have a choice in shaping their networks and are able to

affect network composition. Of course a powerful player like IBM may have more latitude in directing its network than smaller companies, but clearly a deterministic view on networks is not supported by this case. Rather, networks are shaped by the conscious actions of companies. These findings definitely strengthen the call for a more dynamic approach to network research (Oliver, 2001), as compared to the static approaches that are commonly used today.

A fourth conclusion pertains to the method used. By using the method of comparing snapshots of networks over time in relation to a specific event, it was possible to reveal and understand main trends in the IBM network. This method is an extension of the method of repeated observation in case studies (Yin, 1989). In this case the time period for making observations is not chosen randomly. It is connected to a specific event. The combination of a qualitative and quantitative analysis provides a more solid ground for drawing conclusions than a purely qualitative description would have done. Simultaneously it provides more understanding than a purely statistical network analysis could have achieved, because it stays closer to real-life characteristics of alliances (equity vs. non-equity, type of industry of partners, new partner or not). In the case of IBM the method of repeated observations around an event works well: it delivers good insights about relevant changes in IBM's network related to the event of its change of innovation strategy. The disadvantage of the method is that it may be vulnerable to the choice of event and time-windows. Table 4 for example shows volatility in the number of software and computer related alliances. This may be caused by the choice of year. A more continuous picture might have shown another trend for the alliances in these industries. Another limit is that the focus has been on only one event. Even though this appears to be the most

important event for IBM over the period studied, other events occurring during the period 1991-2001 may have had an impact on IBM's network as well. The method used does not allow us to evaluate the influence of those events. Hence, the method is probably best applicable to research looking at the long-term developments of networks around large scale changes which require a number of years to elapse before their full effect shows. More fine-grained case studies are required to obtain detail about the impact of lesser events.

A question raised by this case relates to the effect on the network partners of strategic change in a company. The alliance literature stresses the importance of (personal) relationships, trust and reputation in alliances and networks (Gulati, 1995; Jones et al., 1997). If these elements are relevant then restructuring a network should be a painful and difficult affair. IBM however seems to have adapted its network fairly quickly. Does this mean that these relational aspects are less important than is often thought? Or do these relational aspects apply mainly in a situation of exploitation and if so, what relational aspects are relevant for exploration networks? Or have the costs to changing the network indeed been very high for IBM and its partners? The previous study has not given answers to these questions. Surveying or interviewing partners may help to shed light on this issue. This is especially relevant because little is known about the relative importance of social ties versus business logic in networks. Both have been recognized as relevant influences, but to what extent they strengthen or contradict each other is unclear.

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