

# Concluding Reflections on Strategic Information Systems

## Introduction

The select set of case studies contained in this volume aimed to demonstrate the diversity of SIS applications that have been developed and used in different European countries (as well as in Hong Kong), industry sectors and business functions. By addressing different issues related to strategic information systems, the studies demonstrated the richness of the SIS field and its application domains. At the same time, however, the differences among the reported strategic IT applications showed that there is not (yet) a unique understanding of what SISs really are, what impact they could or should have on business and management processes, and how they relate to gaining a (sustainable) competitive advantage. Therefore, instead of trying to fit these case studies artificially into a common framework, this chapter takes the perspective of an outsider and reflects on the SIS definitional problem, evaluation issues, the relationship between SIS and competitive advantages, and occurrences of SIS-enabled strategic benefits. Some illustrative examples are also provided.

## Definitional Issues

### *Problem Setting*

The term 'Strategic Information System' (SIS) was first suggested in the literature in the early 1980s.<sup>1</sup> However, a decade later, not a single definition

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is commonly applied.<sup>2</sup> The problem of terminology is twofold: not only has the term 'SIS' been used in a variety of contexts, but also different expressions have been employed in the literature to refer to systems that could be classified as SIS. These systems include Executive Information Systems (EISs),<sup>3</sup> Decision Support Systems (DSSs),<sup>4</sup> and Inter-Organizational Systems (IOSs).<sup>5</sup> The boundaries between SIS and these systems are vague and seem to depend more on the author/researcher using the terminology than on any set of objective criteria.

The definitional problem of SIS partly stems from the fact that the term seems to be self-explanatory. However, some confusion arises after a closer look at the key words making up SIS. Although someone might think that 'information systems' have been well defined in the literature, there is no agreement on how and where to draw the line between IS, data processing systems, transaction processing systems, management information systems, management support systems, executive information systems, etc. Is 'IS' a generic term that refers to all the systems mentioned above or should it be defined in such a way that the different types of systems can be distinguished from one another?

This chapter certainly does not intend to reopen the discussion regarding the term 'information systems'; however, if there is no clear definition of the boundaries of different types of IS, how can we expect researchers and practitioners to reach a common understanding of SIS? The other key word, 'strategic', is a well-defined term in management theory. However, it follows from the above discussion that, when used in the term 'SIS', 'strategic' refers to a specific kind of system for which a common definition does not exist.

In a corporate context, strategic refers to a company's business policies and to the strategic impact of certain decisions in a specific domain. Nevertheless, the analysis of the term 'strategic' in the context of SIS shows a variety of interpretations. For example, is a system itself strategic or can only its impact be strategic? Or, viewed from an evaluation perspective, is an SIS necessarily a 'successful' system or can it fail as well?

### *Generic 'Strategic Information Systems'*

What specific features would qualify a system to be 'strategic'? Is it a special set of computer/telecommunications hardware and software requirements? Is it a specific configuration of the system, e.g., integrated, distributed, (de)centralized? Is it necessarily (or preferably) based on a specific (advanced) technology (e.g. artificial intelligence, multimedia, etc.)? Should the system be driven by innovation or by the mere implementation (although new) of a known, old procedure? Do the people involved in the SIS constitute one distinguishing characteristic of the system; for instance, are systems designed

for and used by top management necessarily strategic? Or, alternatively, are certain functionalities required for SIS; for example, are systems that target strategic planning activities necessarily SIS?

It must be clear that none of these dimensions uniquely defines an SIS. Although all the IT applications discussed in this book are based on distributed computer systems, one should definitely not conclude that any distributed system is strategic, nor that this technical feature is a necessary ingredient of an SIS.<sup>6</sup> Neither can user groups be a distinguishing feature of SIS since the majority of these systems are used by managers and their subordinates at different levels of the organizational structure. For example, the dealing system at the Union Bank of Switzerland,<sup>7</sup> although viewed as strategic, was primarily designed for (and used by) dealers who constitute a rather operationally oriented category of the bank personnel.

The innovation issue is a more complex one since it has a time dimension associated with it. For example, today some IT applications based on electronic data interchange (EDI) concepts or on videotex and multimedia technologies are not really innovative any more. In France, early developments of Minitel-based applications were certainly very innovative and had a definite strategic/competitive impact.<sup>8</sup> However, new applications of Minitel-based services can hardly be viewed as innovative, although they might offer some innovative services. On the other hand, the IS literature usually refers to innovative IS implementations as SIS.

In summary, there is obviously 'no such thing as a generic strategic information system, since a particular system derives its role, meaning, and importance only in a given business context – embedded by its organizational and market environments' (Venkatraman, 1991, p. 130). Such a reference to the necessary linkage among business strategy and processes, organizational structure and information technology is nowadays fashionable and generally accepted. However, it applies to any well-designed and implemented information system. How can the setting and characteristics that make a given IS strategic be then described in more concise terms?

### *Some SIS Definitions*

Bakos and Treacy (1986) describe SIS as information systems that generate internal and comparative efficiency. In similarly broad terms, Remenyi (1988, pp. 34–5) defines an SIS as a system that 'helps a firm improve its long-term performance by directly increasing its value-added contribution to the industry value chain. An SIS will give management an opportunity to increase the effectiveness with which a firm relates to and operates within its industry value chain . . . An SIS has an internal orientation with regard to intent [and normally] focusses on a value activity within a specific business unit.'

Other SIS definitions suggested in the literature include the following:

- A use of information technology intended to support or shape the competitive strategy of the enterprise (Wiseman, 1988).
- An information system which either supports or facilitates a particular business strategy or some facet of it (Earl, 1988).
- An information system which gives the firm a competitive advantage by creating new products and services, changing relationships with customers and suppliers, or changing the way the firm operates internally (Laundon and Laudon, 1988).

Ciborra's (1994) requirements for SIS are more restrictive. For him, a system can be referred to as an SIS only if it 'confers a unique sustainable, or otherwise significant, performance advantage'. Therefore, he excludes systems that 'provide only small or short-term improvements'.

According to Liang and Tang (1992), an SIS must have at least three characteristics: 'linking multiple parties, providing direct benefits to the involved parties, and affecting the competition'. The linkage characteristic limits SIS to a specific form of distributed IT applications, namely interorganizational systems (IOS). The second characteristic (provision of benefits) is rather loose and does not specifically mention whether such benefits must be strategic. The third characteristic (the impact on the competition) follows almost naturally from the first one. The importance of an IOS (potential) impact on the competition, and more specifically on the industry structure, has often been analyzed (see, for example, Johnston and Vitale, 1988).

Although there is no consensus in the IS community on what makes an information system strategic and what does not, the following general definition of SIS has been widely used. An information system is considered to have a strategic dimension if and only if:

1. it alters the structure of the industry; or
2. it alters the management and operational processes of the organization; or
3. it changes the competitive balance between companies within the industry.

Although this definition calls for some strong requirements that SIS must fulfill, it has been more widely adopted and used in the IS literature than the preceding ones. The first requirement of this definition (i.e. altering the structure of the industry) is very restrictive since generally only one (or very few) player(s) per industry can affect its structure. Moreover, this requirement can hardly be fulfilled by small players in a given industry (see also Ciborra, 1994).

Altering the management and operations of the organization (second requirement) largely depends on the company size, its business processes, level of IT sophistication, etc. Moreover, it is difficult to actually determine

the extent of changes caused by the (S)IS. The third characteristic (i.e. changing the competitive balance between companies within the industry) raises some issues. Would it suffice if a system helps a company catching up with the competition and thus gaining some additional market share? Would it be necessary that the market leader gets affected, or would it be enough if the fifth player in the market enhances its competitive position and, for example, becomes number four?

The last SIS definition discussed above leads to two drastically different views:

1. Only very few systems can be considered as SIS, namely the innovative ones that lead to substantial changes in products/services, business processes, and organizational or industry structure. Classical examples of such systems include, among many others, American Airlines' computerized reservations system (SABRE),<sup>9</sup> the computerized order entry system (initially of American Hospital Supply Co. and now of Baxter Healthcare),<sup>10</sup> the Otisline database system for elevator repair and maintenance,<sup>11</sup> as well as the recently developed Singapore TradeNet<sup>12</sup> for commercial sea shipping activities.
2. Alternatively, any system that triggers management and operations changes in the company in which it is installed could be classified as SIS (fulfilling the second condition). Examples include newly implemented accounting systems, management reporting applications, computerized purchase/supply systems, etc.

A common denominator in the above SIS definitions is the condition that these systems must provide the corporation with some kind of 'strategic benefits'. However, there are certainly too many cases of information systems that generated little, if any, strategic benefit. An illustrative example here, often mentioned in the SIS context, is the innovative yet unsuccessful self-service ticketing machine made available by TWA but not accepted by customers (Liang and Tang, 1992). Furthermore the electronic integration in the insurance industry did not result in increases in premiums, commissions, or operating efficiency, and therefore has not generated any strategic benefits (Venkatraman and Zaher, 1990).

### *Critical Assessment of the Definitional Problem*

The above discussion focused on the definitional problem of SIS which is twofold. On the one hand, there are too many SIS definitions, suggested either by researchers based on some conceptual work or by practitioners according to their own experiences/views on actual system implementations.

On the other hand, there is not a single definition that can be accepted by all concerned parties.

The positive aspect of the definitional problem is the enrichment of the SIS field through various research and application efforts which should lead to a better understanding of the field. The negative impact, however, of the existing diversity of views and approaches is a rather poor communication between the different parties involved and a dispersion of their research efforts.

### SIS Evaluation Issues

This section discusses the strategic benefits that a company strives for through the implementation of an SIS. Due to the issues raised above, it leaves aside the question of whether these benefits just constitute 'a desirable result' of SIS, or whether they are necessary requirements for a system to be an SIS.

#### *Company-wide Benefits*

The problem of evaluating SISs and thus assessing their 'strategic benefits' mainly results from the expected, but hardly predictable, impact that such systems have on business processes and structures. It is difficult to quantify the value of SIS even through an ex-post analysis. In fact, some SIS implementations can, if successful, so radically alter the operating environment of a firm that precise predictions are impossible to make (Clemons, 1991). The causal relationship between an SIS implementation and subsequent changes in business processes and/or organizational structures still remains to be defined.

Moreover, a thorough evaluation of SIS includes some variables that are beyond a company's control. For example, competitors' reactions may significantly impact the anticipated benefits of SIS. Therefore, the strategies of both the firm and its competitors must be considered when assessing a system's strategic benefits.<sup>13</sup> Consequently, a cost/benefit analysis, for the development of an SIS, that is based on potential competitive impact is fundamentally different from an evaluation based on costs (Clemons, 1991).

Furthermore, in the competitive setting of SIS, the timing of an SIS implementation plays an important role regarding costs and benefits (Liang and Tang, 1992), and thus complicates the ex-ante evaluation. Sometimes an investment that does not appear to be necessary at present is still advisable to preserve a company's future plans. Mitchell and Hamilton (1988) refer to such opportunities as 'strategic options'.

Besides the difficulty of evaluating the positive impact of SISs, it is hard to assess the risk associated with the development, implementation and use

of such systems. Different types of risks should be distinguished: technological risk (issue of hardware/software obsolescence), financial risk, implementation risk (e.g. user resistance), and strategic risk (Liang and Tang, 1992).<sup>14</sup>

### *Industry-wide Benefits*

The multiparty characteristic common to many SISs leads to another evaluation problem. Not only must SIS provide some benefits to its sponsor, it must also result in some payoffs for the other organizations involved or even offer some 'industry-wide benefits' (Johnston and Vitale, 1988). For example, higher entry barriers can increase the average profitability of an industry, whereas higher customer switching costs can increase the bargaining power of a firm *vis-à-vis* its customers (Liang and Tang, 1992). Industry-wide benefits, considered as shared assets among all firms, can be achieved only if the majority of players in a given industry participate in the SIS project. In this context, a banking example is the implementation of automatic teller machines (ATM) which today provide almost no competitive advantage for an individual bank (Banker and Kauffman, 1988) but constitute an industry-wide benefit.

However, if every major player in a given industry adopts the same or similar SIS, then any strategic benefit (or competitive advantage) for a specific company loses its ground (Ciborra, 1994). Liang and Tang (1992) discuss the likelihood of a price war resulting from some industry-wide benefits provided by SIS. They suggest determining the potential benefits and their degree of 'transferability' to a firm for both 'price-war' and 'no-price-war' scenarios.

### *Competitive Advantage versus Competitive Necessity*

The previous discussion leads to another interesting issue, that is whether SISs are only those systems that provide a sustainable competitive advantage. Without getting into the definitional problem analyzed above, it is clear that adding such a requirement would not only drastically reduce the number of implemented systems to be considered as SIS, but also significantly shorten the potential life-span of such a system as an SIS. Studies of several industries in the USA have shown 'that an (SIS-based) sustainable competitive advantage is quite rare and quite difficult to achieve' (Clemons, 1991). For Feeny and Ives (1990), 'if the sustainability analysis shows that an [IT] application, despite offering attractive benefits, cannot be defended against the competition, management should forego the excitement (and cost!) of pioneering the idea and settle for a fast, cheap, and effective follower'. Ciborra (1994) even states that 'it is dangerous to believe that an information system can provide an enduring business advantage'.

It has become increasingly a competitive necessity to integrate information systems (regardless of their name or label) with management/business policies to offer customers new or enhanced products and services. The increasing need to use various IT-enabled functionalities is widely recognized in business, although IT benefits are not easy to achieve nor to measure. Consequently, employing basic microeconomic principles, most important players in a given sector have developed/used similar systems. Thus, for Manheim (1992), 'there is no significant, long-term competitive advantage to be achieved in these areas. Doing these things well will yield, at most, only a modest and short-term competitive advantage. Nowadays, the simple integration of selected business processes is a competitive necessity, and not a source of competitive advantage'.<sup>15</sup>

### Occurrence of Strategic Benefits

#### *Venkatraman's 'Five Levels of IT-induced Business Reconfiguration'*

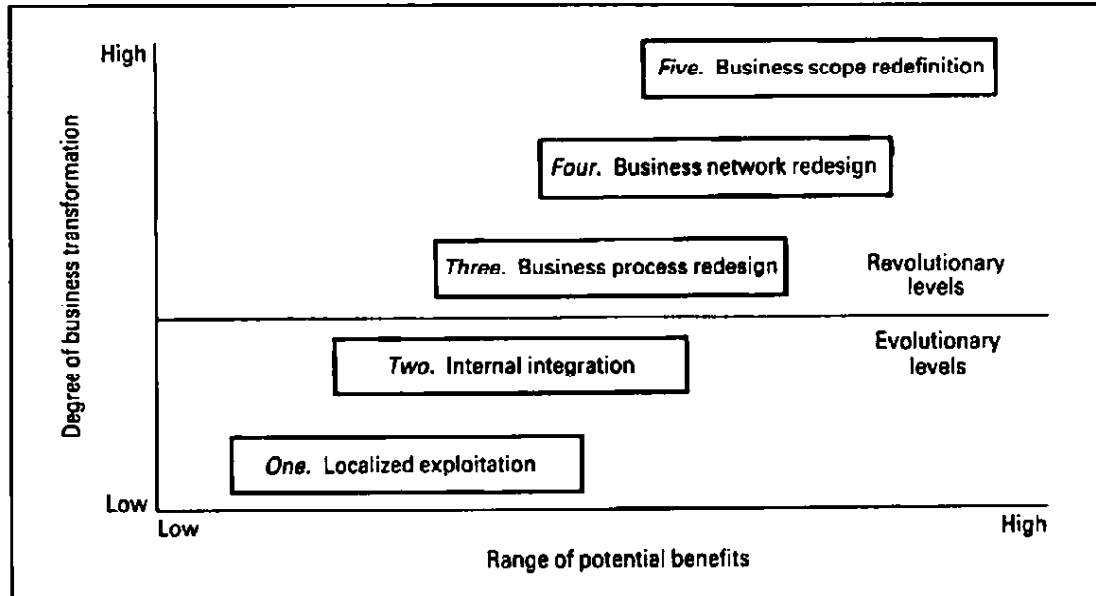
Venkatraman (1991) analyzes the various structural impacts of IS in and for a corporation and suggests different business/management circumstances in which such systems provide strategic impact and/or strategic benefits. He considers IT-induced business reconfiguration as an evolutionary process having five stages (see Exhibit 1). In level one, called 'localized exploitation', IT benefits result from applying IT in an isolated business function or even in just one activity. Classic examples of systems here include order entry systems, Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) systems, and customer support systems. According to Venkatraman, the use and the benefits of some implementations of these systems have been so overwhelming that they have been considered as SIS.

The second level, called 'internal integration', refers to the establishment of a company-wide IT-platform linking the previously isolated activities. Such an IT infrastructure leads to efficiency and effectiveness benefits based on information sharing across several business functions. Efficiency is based on time and thus on cost savings; effectiveness improvement is usually achieved from additional value-added services. Although the impact of a well-designed company-wide IT platform on business processes and organizational structures should not be underestimated, only the customization of such platform to a given organization might lead to strategic benefits.

The third level in Venkatraman's model is 'business process redesign'. In this level, IT leverages the reshaping of business processes, enabling an efficient and effective alignment between business activities and the IT platform (see, e.g., Tapscott and Caston, 1993, Champy and Hammer, 1993, and Davenport, 1993). Although subsequent benefits from such a redesign might be triggered through IT, they are certainly the result of both IT usage and management efforts.



**Exhibit 1** *Five levels of IT-induced reconfiguration*



'Network redesign', Venkatraman's fourth level, refers to the electronic integration of suppliers, customers and 'everyone who can contribute to the firm's effectiveness' under the common SIS roof. It describes cooperation based on electronic integration as an important alternative to vertical and horizontal integration.<sup>16</sup> Venkatraman's highest level of business transformation, 'business scope redefinition', describes the enlargement of a company's business scope through selling 'repackaged and specifically analyzed' information or through the addition of value-added services.

### *SIS-based Cooperation*

The concept of IS-based cooperation, interorganizational information systems (IOS), coincides with Venkatraman's fourth level of IT-based network redesign. Konsynski and McFarlan (1990) describe four different kinds of information partnerships: joint marketing partnerships, intra-industry partnerships, customer-supplier partnerships, and IT vendor-driven partnerships. Examples for joint marketing partnerships are the cooperation between IBM and Sears to market Prodigy,<sup>17</sup> or the ones among airlines, hotels, rental cars, and bank credit cards (e.g. American Airlines' SABRE system). In these cases the cooperation provides access to new clients and thus allows for economies of scale through cost sharing. Additional advantages for the system sponsor are an enlarged business scope through selling excess IT capacity, as well as the reputation of an innovative company

and appropriate business partner(s). Intra-industry partnerships pool capital and skill resources and thus may contribute to new technology infrastructure for an entire industry. Examples include ATM banking networks and insurance value-added network services (IVANS) which consist of a coalition among competitors.<sup>18</sup>

Customer-supplier partnerships are the oldest and most widely spread form of IT-based cooperations. Examples include Baxter Healthcare's order entry systems (formerly American Hospital Supply's) and retail grocery chains. IT vendor-driven partnerships are the rarest form of IT-based cooperations. They occur when technology vendors bring their technology to a new market and provide a platform for industry participants to offer additional customer services. Alternatively, an information vendor may create a research alliance with a major customer.

Johnston and Vitale (1988) distinguish two types of cooperation-oriented SIS according to their business purposes:

1. systems designed as a means to gain a competitive advantage over competitors through supporting a basic business unit of the sponsor (e.g. American Hospital Supply's ASAP);
2. systems designed as a business unit themselves (e.g. NewsNet offers numerous on-line services).<sup>19</sup>

While systems in the first category form a subgroup of SIS aimed at network redesign (fourth level of Venkatraman's model), those in the second category achieve some kind of business scope redefinition (fifth level of Venkatraman's model).

Such SIS-based partnerships enable companies to strive for competitive benefits by introducing new ways to cooperate (Konsynski and McFarlan, 1990). These partnerships could help especially small companies to reduce costs so that they can compete with the big players in the market. (See Clemons, 1991, for specific examples.)

### Concluding Remarks

The above discussion of several schools of thought that exist in the strategic information systems field shows that the IT applications reported on in this book do not all fit a single definition of SIS. This fact demonstrates both the broadness and the richness of the SIS concept. Moreover, the methodologies for identifying/planning strategic applications of IT – reviewed on pages 11–33 – should provide an effective means of generating SIS ideas, although there is little solid evidence about their relative effectiveness.<sup>20</sup> However, what is really important is a commitment of the firm's management to proceed with a systematic approach to the identification of SIS opportunities.

Several of the case studies contained in this book as well as numerous

examples described on pages 11–33 illustrate the competitive philosophy underlying the development of some SIS applications. They demonstrate how companies today compete on the use of their information systems and technology and how they are increasingly seeking (or at least willing) to share their IT platform with their business partners (such as their customers and/or suppliers), with firms in other business sectors (complementary or not), and sometimes even with rival companies (e.g. within a consortium structure). Benefits to gain from such an IT partnership include cost reductions at both intra- and interorganizational levels, increased market share resulting from enlarged scope and broader customer base, as well as higher switching costs and barriers to entry. Additional benefits include increased product differentiation, improved corporate image, and the creation of new (IT-enabled) business opportunities.

The contribution of the reported case studies lies in the numerous lessons that can be drawn from them and their multifacet nature. The main driver underlying the documented SIS applications was a *business pull* (as opposed to a *technology push*) to solve a problem or to implement a plan. Specific issues that were addressed include: IT risk assessment and SIS project management (emphasized in the British Petroleum case), strategic IT adoption (main issue in the Leroy-Merlin case), IT-enabled service innovation (central to the Minitel and CAMIF cases), strategic IT investment and leveraging information assets (addressed in the CompuNet AG case), time-based competition through IT (analyzed in the Union Bank of Switzerland case), IT support of a customer-oriented marketing strategy (as highlighted by the Royal Hong Kong Jockey Club case), creation of new market niches through IT (as the CORTAL/Crédit Commercial de France case demonstrated), business process redesign and electronic integration within the firm (as illustrated by the Otis Elevator case), as well as strategic IT partnership across the firm (vividly presented by the Brun Passot case).

Moreover, in spite of their eclectic nature, the cases mentioned above clearly demonstrate that the strategic/competitive use of IT does not depend on a company size, structure and type (private or public), geographical location, business sector or financial strength, nor on its existing IT infrastructure and capabilities. It rather depends on the organization's commitment to and support of information technology as well as management perception of the IT role in the firm. Managers should keep IT capabilities in mind especially when formulating business plans and integrate information systems into SBU/corporate policies. *Management challenge is therefore to effectively create and manage the link between IT and business strategy.* This link will be an essential success factor for corporations in the twenty-first century world of the electronic information highway and the networked society.

## Notes

1. Examples include Bakos and Treacy (1986), Cash and Konsynski (1985), Clemons (1986), Clemons and Row (1988), Copeland and McKenney (1988), Henderson and Venkatraman (1989), Ives and Learmonth (1984), Johnston and Vitale (1988), McFarlan (1984), Porter and Millar (1985), Vitale (1986), and Wiseman (1988).
2. For further elaboration on the definitional problem, see King and Kraemer (1989).
3. See, for example, Volonino, Robinson, and Watson, 1992.
4. See, for example, Angehrn and Jelassi, 1994.
5. See, e.g., Cash and Konsynski, 1985, and Johnston and Vitale, 1988.
6. For examples of localized systems that provide strategic benefits, see Venkatraman (1991), pp. 129–30. On the other hand Johnston and Vitale (1988) state that most successful examples of competitively advantageous information systems are those that link a company to its suppliers.
7. See the Union Bank of Switzerland case study included in this volume.
8. See the case studies 'A Home Retailing Application at CAMIF' and 'Home Banking: An IT-based Business Philosophy or a Complementary Distribution Channel? CORTAL 'versus' Crédit Commercial de France' included in this volume.
9. For more information on SABRE, see Copeland and McKenney, 1988, and Hopper, 1990.
10. For more information on this system, see Main and Short, 1989, and Konsynski and Vitale, 1991.
11. See the case study 'Staying at the Top with Otis Elevator: Sustaining a competitive advantage through IT' included in this volume, and also Stoddard and McFarlan, 1986.
12. For more information on the Singapore TradeNet, see King and Konsynski, 1990.
13. Liang and Tang (1992) even define strategic benefits of SIS as those benefits that are affected by competitors' strategies.
14. For a comprehensive and thorough discussion of assessing IT risk, see Cash, McFarlan, McKenney and Applegate, 1992.
15. The necessary degree of integration certainly depends on company size and business mission.
16. Konsynski and McFarlan (1990) state: 'The really new opportunity is in joining forces without merging.'
17. In the early 1990s and at cost of more than \$500 million, these companies have assembled a package of more than 400 electronic data services – home banking, grocery shopping, stock market quotations, restaurant reservations, and so on – to be delivered across a standard telephone network to millions of American homes. As Cash et al (1992) put it: 'Individually, these services would be used so infrequently – and cost so much to get hooked into – that few customers would be likely to find any one of them practical. IBM and Sears have perceived that these services have considerable appeal when bundled together. By selling advertising space around the edge of the screen, the partners are able to deliver the product to a home for only \$130 per year irrespective of usage.'
18. An intra-industry partnership may be actively led by government, e.g. the TradeNet system of Singapore, which manages the world's largest commercial shipping port (Konsynski and McFarlan, 1990).
19. These services include access to newsletters provided by independent publishers,

airline reservations, stock quotations, etc. NewsNet essentially acts as a facilitator, allowing organizations to communicate through a network (Cirrus system) of more than 10,000 ATMs.

20. For example, Porter's value chain analysis and Wiseman's strategic thrusts methodology were compared in Bergeron, Buteau and Raymond, 1991.

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