Abstract

Since the bulk of management information systems (MIS) research in the past has been 'domestic' in nature, it has failed to grasp the strategic challenges posed by information systems found in multinational corporations. As they usually involve hundreds of data centers, their scale is much larger than the size of systems normally studied. Theories developed in international business can be useful in providing categorizations for analysis. These include headquarters–subsidiary coordination, corporate intelligence systems, internalization, firm-specific advantages, and host-country/MNC relations. As each area is integrated with MIS research, it raises a series of questions involving technology, systems development, human resources and computing economies.

Keywords: International business enterprises; Competitive advantage; Corporate intelligence; Coordination; Interorganizational systems; Systems development; Internalization theory; Firm-specific advantage; Multinational corporations

1. Introduction

Examining the role of information technology (IT) in multinational corporations is a key to understanding the world economy. The multinational corporation of today operates on a breathtaking scale. It typically has business operations and data centers in dozens or more countries. It often engages in several lines of business with patterns of management activity dependent on the area of the world where it is doing business. Multinationals account for the bulk of world trade, more than 70 per cent of which takes place intra-firm, e.g. between different parts of the same corporation (Encarnation, 1992).

Multinationals control their foreign subsidiaries under complex ownership structures. They may use a 100 per cent ownership form, a joint venture with a company considerably larger, an agreement with the host country for partial state
ownership, or any number of other contractual arrangements. Foreign operations might involve direct manufacturing, licensing of technology, research and development or other pieces of the value-added chain including a separate product division.

Multinational corporations are major users of information technology by even the most conservative estimates. They engage the most advanced applications and technologies, and in comparison with other business enterprises they have by far the largest geographical scale and scope in their data processing operations.

Multinationals continue to make increasing use of information and telecommunications technologies to improve their worldwide operations on a scale never before seen in history. For example, Colgate Palmolive is working to create a common hardware, software and communications architecture throughout the world. Agence France-Presse has created a X.25 network to transmit text, images, and sounds, throughout its operations in 129 countries in six languages. General Electric Company (USA) has set up a worldwide voice, data and video link to tie together its facilities in Europe, South America and the Far East. Grand Metropolitan is using electronic mail and artificial intelligence to help integrate its highly decentralized environment. P.T. Freeport Indonesia has created a network for fax, data and voice linking together its New Orleans corporate headquarters with its mines in Tembagapura, Indonesia, an office in Singapore, and Cairns, Australia. Holiday Inn has constructed a satellite-based private network to link together its many locations into a single centralized reservation system. Upjohn Pharmaceutical has built a teleconferencing system to conduct medical symposia with participants all around the world. In every sector, companies are working to update their IT infrastructure (Wiggin, 1987; Martin, 1990; Barham, 1990-91).

The multinational corporation typically processes data in most parts of the globe, many times with several or more data centers per country. It is not uncommon to see firms with hundreds of data centers burdened by non-standard equipment bases and scarcely compatible data structures.

Although these global networks of computer centers represent some of the most expensive and complex technology ever built, it is not entirely clear what they really do. Even less explored is the question of what theoretical tools we have to analyze their functions.

This paper argues that at least five of the major themes of international business theory can be shown to have a direct relationship with information systems questions and can therefore generate new areas of research on the multinational.

2. The literature

Some of the earliest research concerning information technology and the multinational corporation appears in Antonelli (1984, 1988) who studied the emerging effects of international telecommunication systems. Written in Italian a full 10

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1 Take 3–5 per cent of the total annual revenues of the top 2000 MNCs to get an estimation of expenditures on IS worldwide.
years before similar studies appeared in the United States, his work demonstrated that the international telecommunication systems of multinationals form an integrated nervous system allowing geographically extended enterprises to coordinate their activities. Other studies show that data centers linked together can be used to support geographically dispersed European-wide logistics and engineering coordination (Bakis, 1987a), and can support a 'required dispersal of factories' so that intra-firm imports and exports can be balanced between different countries (Bakis, 1987b).

Information technology and telecommunications in the MNC can be used for both defensive and offensive strategies (Hagström, 1990, 1991; Ledin, 1990). As they compete in their battle throughout the world, firms engage in a type of 'technoglobalism' wherein the role played by IT in strategy is to reduce response time to important external events (Imai, 1991a,b). These events are generated by regulatory regimes which constitute the 'environment' for international information processing systems. The regime in any particular country might force the multinational to make adjustments in how it deploys information systems (King and Sethi, 1991). In Japan, for example, the same technologies are useful in a different cultural setting (Masuda, 1985), although Japanese culture forces companies to adopt more flexible data processing arrangements (Ochiai, 1987).

Although information systems can help a multinational lower the cost of extending its geographical reach in 'accessing international markets' (Gurbaxani and Whang, 1991), global communication networks may also be used to extensively monitor and control overseas operations and to promote a strong form of corporate centralization in some firms (Ishikawa, 1990). A blend of regional and local data centers may be used to strike a balance between centralized and decentralized processing, resulting in a 'hierarchy' of systems. The distribution of investment and deployment of information systems (IS) also can be matched to the peculiar nature of a specialized market, resulting in the substantial build-up of local processing capabilities and operations all within the context of an integrated global system (Mookerjee and Cash, 1990).

It appears that the development of flexibility in international information systems can be based on different 'generic' architectures which set out to integrate business strategy and systems design (Gibson, 1993). New trends in application of telecommunications and information systems in multinational corporations can lead to re-organization at the departmental level as well (Giga, 1986). For example, global re-organization can be applied to the management of research and development support systems (Imai, 1991).

Management of the transition to a global information system based on new opportunities in telecommunications can be done by moving internal corporate information around the globe, opening up electronic gateways to customers, suppliers and alliance partners, giving access to repositories of critical corporate knowledge and providing a basic infrastructure to implement new management initiatives (Daniels and Frost, 1991). Some argue that international technology linkages may enable a firm to become a 'virtual global corporation' by building cooperative alliances so as to coordinate service internationally (Clemons et al., 1992).

The placement of applications and databases may change as firm evolution follows
a 'natural progression' from 'domestic', to 'exporter' to 'natural adaptor' to 'central coordinator' and finally to 'global coordinator' (Ives and Jarvenpaa, 1991; Butler Cox Foundation, 1991), and the management of a multinational's information system can be modeled by learning curve theory to show how globalization is an end-step in this development sequence (Daniels, 1993; Daniels et al., 1993).

A constant stream of 'issues identification' research has defined a variety of frameworks to classify management opinion regarding development, planning and management of international information systems (Sethi and Olson, 1992; Earl, 1988). Unfortunately, there is a wide divergence in results, and even now it is difficult to draw definitive conclusions about many issues, thus revealing the complexity of factors to be considered (see Novotny, 1985; Deans and Kane, 1991; Deans et al., 1991; Ives and Jarvenpaa, 1991; Palvia and Saraswat, 1991; Palvia et al., 1992; Sankar and Prabakar, 1992; Deans and Ricks, 1993; Ives et al., 1993; Palvia, 1993).

Further research, however, can build upon international business theories so as to broaden the field of phenomena which can be explored. International business studies draw upon the currents of economic history, international political economy, international relations, international law, sociology and their related fields. International business theory attempts to answer how to run a multinational corporation, how to structure its operations, how to control subsidiaries, how to formulate strategy and how to cope with the myriad of restrictions and opportunities placed in the environment by the more than 130 countries of the world in which the MNC might wish to do business. Above all, it attempts to get at the question of why multinational firms engage in foreign direct investment and what is the economic mechanism underlying their remarkable success.

3. Five perspectives of international business theory

3.1. Headquarters–subsidiary coordination

3.1.1. Example

The problems of headquarters–subsidiary coordination are illustrated by the Ford Motor Company which struggled to re-shape its global information systems throughout the 1980s to conform with its new strategies in manufacturing, design and component acquisition. Its objective of driving down costs for manufacturing led it towards a system of worldwide sourcing of parts and assemblies for its 'world car'.

Ford's IS department was faced with building an engineering release system which would have characteristics of being both centralized and decentralized. When the design specifications for a car part change, however slightly, the detailed information is compiled in the engineering/design department. These detailed design changes, called 'engineering releases', must be quickly transmitted to different manufacturing locations around the world in order to ensure coordination of changes in components.

Ford introduced an innovative CAD/CAM network capable of facilitating rapid transmission of engineering information between sites in different countries. The
system provides several related functions: (1) it is capable of acting as a central repository for engineering information for the entire company, (2) it can simultaneously and quickly release standardized information to many different manufacturing locations around the world, (3) it acts as a collection point for engineering reports coming from different parts of the world which might be of interest to either central engineering or to other manufacturing locations.

The Ford case shows the problem of coordination both from headquarters to subsidiaries as well as from subsidiaries to subsidiaries. This type of systems development is being repeated in sector after sector as the integration of geographically dispersed production continues to develop around the world.

3.1.2. Theory

Coordination may be defined as the exchange of information and data between geographically dispersed areas of the multinational in such a way as to communicate and synchronize management decisions and operational actions. It is the most often mentioned function of information technology in the multinational corporation. Technology aids management in coordinating the operations between the headquarters and its subsidiaries and increasingly between subsidiaries themselves in a horizontal direction.

Researchers have examined the types of formal and informal information exchanged, usually on a manual basis, and have been particularly interested in how this indicates where decisions are best made and how the effective locus of decision taking might influence the sovereignty and general well-being of host countries as well as the competitive structure of the MNC.

The pioneering work of Egelhoff (1988a,b, 1992) has gone farthest in developing an information processing view of the multinational corporation consistent with what is known about its organizational structure. Egelhoff's model includes both computerized and manual flows of information, including formal and informal management communications. Although he does not distinguish between models of communication, he is able to demonstrate that the direction of information flows in the nervous systems of multinational corporations is both vertical and horizontal.

We know that new information technologies such as electronic mail, voice mail, teleconferencing, digital facsimile, distributed processing, the World Wide Web, and the information superhighway promise to change the nature of management and information within companies. There should be more potential for transparency in decision taking and perhaps a tightening of coordination, as seen in studies of cycle time reduction. It should also be possible to extend this analysis to the multinational corporation and study relations between headquarters operations and individual subsidiaries. In addition, inter-subsidiary coordination might be examined as subsidiary–subcontractor or subsidiary–customer relations are further strengthened by the accelerated computerization of information flows (see Fig. 1).

Real-time electronic linkages between sub-units of the MNC, and between the MNC and its many overseas suppliers, are critical elements in manufacturing where 'lean' processes imply collapsed time intervals and the creation of information systems spanning intra- and interorganizational and functional boundaries. Some
have concluded the horizontal flow of coordination information may be much greater than the vertical flows to and from the headquarters, indicating a 'new' type of MNC based on 'heterarchy' (Hedlund, 1986, 1993).

It appears, however, that centralization is still the preponderant model in today's firm (Butler Cox Foundation, 1991). Nevertheless, headquarters staff already face stiff challenges as they manage geographically dispersed data processing operations, and struggle to adopt to variated national conditions and relationships overseas.

Telecommunications are producing a growing role for 'interorganizational systems' linking together a variety of firms (Johnston and Vitale, 1988), but the information interface or 'boundary' between one firm and another has many different architectural possibilities which must be chosen properly in order to be most effective (Konsynski, 1993). Interorganizational linkages can be applicable to a variety of areas including banking, just-in-time logistics, airline reservations or hospital supply. They can aid a firm in tying together more closely its business partners but the
potential inflexibility of these electronic bonds may end up limiting the firm's strategic options (McFarlan, 1984).

Interorganizational linkages have been found to be prevalent in the Italian textile industry (Rullani and Zanfei, 1988) and shown to influence basic market structures (Antonelli, 1988; Fornengo, 1988). Producing both savings and competitive advantages (Clemons and Row, 1988), they can be used to lock out competitors from supplier and customer relationships, and their overall value can be understood by application of the customer resource life-cycle model (Ives and Learmonth, 1984).

Interorganizational systems can so improve coordination that multiple channels of market transactions in an 'electronic market' may weaken individual firm-to-firm bonds (Malone et al., 1989). The coordinative effects of interorganizational systems extend into companies to synchronize internal processes (McGee, 1991), and may be leading to the development of 'multi-organizational' structures which will reduce inventory costs and result in 'coordination-intensive' structures with considerably less vertical integration (Malone and Rockart, 1991; Malone and Crowston, 1993).

3.2. Corporate intelligence

3.2.1. Example

Toyota's use of satellites to speed defect and service information back to Nagoya, echoed years later by Volkswagen's installation of a European-wide VSAT network to accomplish the same function, and Benetton's use of international computerized linkages to provide timely information supporting dye-on-demand processes are three of the many examples of environmental scanning and market monitoring systems we see proliferating at the international level. They exemplify a type of corporate intelligence system which feeds critical information to decision takers at headquarters.

One of the largest and most admired pharmaceutical companies, the Merck Corporation, faces a myriad of national restrictions in each market it serves and must rely upon constant reporting of results from overseas field trials as new drugs are developed. Prior to its creation of a global reporting system, sales and cost data on overseas markets were compiled at each subsidiary location and sent by courier, facsimile or telex to headquarters for the consolidation process. Merck realized that more timely and frequent reporting had the potential for improving performance and installed a system which allowed different types of equipment at each subsidiary location to up-load complete financial statements monthly or weekly as needed. This allowed corporate headquarters to monitor more closely events in the many subsidiaries around the world.

3.2.2. Theory

The development of corporate intelligence involves the systematic collection and analysis of external event-related information for the firm and the reasoned use of that information in development and implementation of strategy. It is also called 'environmental scanning', 'competitor intelligence', 'market research' or 'competitive analysis'.

Development of marketing intelligence is vital for inventory control and product design responsiveness (Skyrme, 1990; Douglas and Wind, 1987; McLeod and Rogers, 1985). The 'transactional intermediation' brought about by effective intelligence is one reason global trading companies have been able to grow so successfully and remain sensitive to market changes. In the 1970s, most of the literature, much written by former intelligence officers moving into the private sector from government, focused on the collection of economic, political and security 'intelligence' concerning the foreign environments in which the MNC was operating. Environmental intelligence was recognized as a critical element in long-range planning (Schollhammer, 1971).

Multinational corporations must monitor a number of variables including economic, political, cultural and social developments (Rugman, 1985; Keegan, 1974). Large amounts of corporate intelligence must be based on human sources (Keegan, 1968) and should be coordinated with staff functions at the headquarters, division, regional and country levels (Keegan, 1972).

Integration of external information with the strategic planning function requires the engineering of a dedicated 'interface' (Kennedy, 1984; Kilman and Ghymn, 1976, 1977), although there are dangers of embarrassing failure if the intelligence is not shared properly in the firm (Ghoshal and Kim, 1986). If intelligence is inadequate, the multinational might not protect itself against threats of international terrorism (Mickolus, 1978).

This perspective on information technology in MNCs relates closely to the considerable body of literature on decision support systems (DSS) because widely heterogeneous pieces of information must be consolidated and presented at the correct time in a form usable to the particular decision taker. Although sales information is easier to develop, since much is internal to the firm, the heterogeneous nature of external events raises the issue of how the information they produce can be handled through computer systems.

3.3. Internalization

3.3.1. Example

When Whirlpool purchased the white goods manufacturing arm of Philips N.V. in Europe, the information systems function was left wondering how it was going to transform the newly acquired operations into an integrated corporate entity. Although the Whirlpool plant in Clyde, Ohio is one of the most sophisticated in the world, there are indications that key players in the systems development area were uneasy regarding the new challenge presented in working with Europeans. Problems of language barriers, different cultural styles, and the massive problem of compatibility of data structures and platforms were overlooked by top management when they calculated the strategic 'synergy' of the acquisition. As the information systems are merged, regaining lost efficiency might be a lengthy process. It will take years for Whirlpool to make the new combined operations as efficient on a transaction by transaction basis as was its internal US operation before the acquisition.
3.3.2. Theory

Internalization theory is used to partially explain the rise of the multinational corporation. Based on the model of Coase (1937), it holds that a firm grows by internalizing economic transactions which previously were carried out on the open market. Internalization theory can be extended to the MNC to explain its growth into foreign markets powered by its ability to conduct intra-firm economic transactions at a cost less expensive than the market (Buckley and Casson, 1976). Internalization is one of several features explaining the global distribution of international production (Dunning, 1988). Internalization can be used to develop a transaction cost model of intra-firm economics showing that if the administrative costs of processing economic transactions becomes too great, the firm stops growing (Williamson, 1975).

In examining information technology, we can distinguish two aspects of internalization. First, IT is used to drive down the cost of each information transaction in the firm. If the enterprise is an 'information-intensive' business, this should power expansion. Second, it can accelerate the general internalization of all economic transactions, e.g. not only information-based transactions.

Internalization theory has been built up particularly with regards to raw materials processing, manufacturing and transportation; but not to the same degree with regard to information-intensive industries such as banking, finance, insurance, and publishing. It may well be that in those sectors information technology is the single most important factor in explaining competitive outcomes. Just as coordination is critical to the manufacturing sector, questions of internalization efficiency are critical to the financial services sector, where profits often are generated as a percentage of each transaction.

3.4. Firm-specific advantages (FSA)

3.4.1. Example

When Citibank expanded its operation in the Netherlands it used a new type of account management system which allowed the finance and accounting departments of its customers to access their records online and thereby see their balances in a number of jurisdictions and currencies. Citibank rapidly took market share from Rabobank, a leading Dutch financial house. An even starker picture of an IT-based FSA is indicated by Citibank's dramatic move into Kazakhstan soon after the break-up of the USSR. It was able to use satellite telecommunications technology to make available cash management, treasury functions, and payroll banking operations into a fully operational system deliverable there in only a few weeks. This was done by 'projecting' proven London and Frankfurter-based financial management systems via satellite directly to Kazakhstan.

These cases involve a new phenomenon - the spatial projection of competitive advantage across international boundaries. The technique is to obtain the tactical advantage of surprise against competitors by a swift projection into foreign territory of unique firm capabilities driven by superior data processing.
3.4.2. Theory

An eternal research question of international business is why a firm becomes a multinational corporation and engages in foreign direct investment (FDI) instead of just exporting. One important line of theory holds that firms set up operations overseas because they have some type of advantage in the target market. This is termed the 'firm specific advantage' (FSA).

A pharmaceutical patent recognized worldwide, for example, may give the firm a strong advantage over competitors in a national market. Other FSAs might include cheaper capital or proprietary ways of working and providing services which can not be duplicated easily by others. Trade secrets can also be FSAs.

Firm specific advantages are by no means the only factor determining FDI. Government regulations, including trade barriers, also play an important role in the FDI decision, and there may be other reasons compelling a firm to engage in FDI. Of specific concern here, however, is the range of computer-based technologies and skills possessed by a firm giving it a strong advantage in a national market (Dunning, 1988).

3.5. Host country–MNC relations

3.5.1. Example

American Express finds that it must build separate data processing facilities in certain European countries in order to meet privacy regulations. Ford Motor Company finds it is unable to use the newest front end communications processor for its IBM mainframes in Brazil because they are not licensed by the government – and are unlikely to be since there is a 'substantially equivalent' Brazilian product. The Swedish Parliament debates the potential national security risk of having the Malmo firehouse connected to computers in Cleveland, Ohio. Potential investors in India are told indirectly that the number of data processing jobs they transfer to that country will be a factor in whether or not the investment will be approved by the government. A company finds it is experiencing lengthy delays in getting approvals for leased circuits, even though its national competitor does not seem to be having the same problems.

These are all examples of how government–MNC relations can spill over into the realm of information technology. Data processing may be used as a pressure point to bridle foreign firm performance in a national market. It has long been argued, for example, that some nations have used privacy regulations and other data processing controls as non-tariff barriers (NTBs) to international trade.

3.5.2. Theory

From a perceived threat to national sovereignty posed by the multinational, to restrictions, driven by industrial policy, placed by the host country against a firm's general operations and supporting information systems, host country–MNC relations have been one of the most widely researched areas in international business. There are many factors – political, economic, and cultural – which determine the balance of power between the MNC and those countries acting as 'host' for its activities. Some,
however, see technology as the key driver of the bargaining relationship between multinationals and their overseas hosts (Doz, 1979; Doz et al., 1981).

Information technology can be seen as a definable subset of the host country–MNC issue. Host government restrictions can be targeted against international computer networking and the importation of equipment needed to support it. The regulation of transborder data flow (controlling the operations of computer networks across national borders) is a major breeding ground for conflict between the MNC and host governments whose controls, although well-intentioned, can constitute a significant non-tariff barrier (NTB) to trade.

Host country–MNC relationships at the information processing level can also change the international division of labor (Turn, 1979). Schiller (1983), for example, views computerization as a negative force helping the MNC take advantage of (i.e. exploit) developing countries. Although technology transfer, licensing and transfer pricing are each important areas of government regulation, most agree that in the absence of an international agreement, transfer of technology, including computing, will not take place of its own accord (UNCTC, 1990), and the division of labor will remain out of balance.

Host government-imposed restrictions which seek to alleviate these problems may be classified into three groups: restrictions on hardware and software availability, restrictions on networking, and restrictions on the use of applications (Roche et al., 1992). Importation of computers can be subjected to high tariffs and fees or quantitative restrictions, utilization of local programming skills may be emphasized by the host country as it denies work visas to employees from headquarters, licensing of international database access may be restricted as a means to force the MNC to ‘build’ a duplicate database inside the host country, prohibition against private networks may be used to force the MNC to use more expensive volume-sensitive services in order to subsidize an inefficient national bureaucracy, and onerous database maintenance requirements may be enforced under criminal and civil penalties in the name of protecting individual privacy. Stipulations may be made that the MNC operate data centers within the host country regardless of economic considerations.

There is no apparent limit to interference in international computer networking, but some states also work their policy in the opposite direction. In these cases, state-generated enhancement of telecommunications infrastructure is used to tip the balance in favor of foreign direct investment (Corey, 1993). States may also engage in accelerated training of computer operators, programmers and engineers as another way of improving factor endowments (Bhatnagar, 1992). This development strategy is sometimes implemented at the local or regional level within a country (Cook, 1985).

4. Research agenda

These general theories – headquarters–subsidiary coordination, corporate intelligence, internalization, firm specific advantage, host country relations – each have components with implications for viewing the role of information and thus, by
extension, data processing in the multinational corporation. They can be used to generate a series of research issues.

4.1. Headquarters—subsidiary and subsidiary—subsidiary coordination

As the view of IT in the multinational is adjusted to accommodate a horizontal as well as the more traditional vertical view of information flows, what can we learn about the general relationship between the structure of the firm and the architecture of its information system? How is IT used to exert strategic management control? What is the emerging information technology balance and distribution between headquarters and overseas subsidiaries, and how is this changing as the firm adopts different strategies? Note that this question is not as easy to study as it might first seem; the information systems in a multinational can be broken down into key components — hardware, data depositories, software, end-user devices — each of which can exhibit markedly different global distributions. This makes it impossible to determine a simple one-to-one match between firm strategy and IT architecture.

The ownership characteristics of overseas subsidiaries are another factor. Their variability (e.g. partial equity ownership, joint ventures) means that headquarters—subsidiary relations in the international context should be thought of as having some characteristics of IOS in the domestic context. How can we account for the emerging creation of complex global alliances and the information technology infrastructure which supports them? To what degree does the IT infrastructure of today’s MNC include interorganizational systems (IOS) with business partners or other external entities? Can IOS theory be applied to international joint ventures? What is the trend?

How does the locus of decision taking change with new technology? Can groupware and related technologies transform how firms coordinate their international activities? Will new technologies such as the information superhighway so drive down telecommunication costs that entirely new architectures or forms of coordination emerge?

4.2. Corporate intelligence systems

What is the role of the IT function in developing an information engine to help the MNC scan for external information overseas? How can IT work to improve the processing of these heterogeneous information flows? What type of information systems can be created to automate the collection and efficient retrieval of intelligence data? Can systems analogous to retailing POS achieve the same efficiency gains in an international context? How can relevant information be collected (translated), refined, synthesized, and communicated across the entire intelligence cycle? A parallel area of inquiry concerns how to use information technology in crisis management situations, such as during a product tampering scare, a corporate hostage situation or a political coup d’état.

Planning systems development also raises questions. How does engaging in a systems development effort to build corporate intelligence capabilities differ from enhancing coordination between manufacturing subsidiaries? In contrast to
coordination-oriented information systems, are corporate intelligence systems more likely to be centralized, and involve sporadic reporting of heterogeneous information?  

Undoubtedly, government intelligence services have developed technologies which are used to examine efficiently large volumes of heterogeneous external information derived from environmental scanning, intelligent probing, and focused collection efforts; but there is little indication this technological expertise has been transferred to the private sector, and to the MNC. Can lessons be learned from government intelligence activities? Can expert systems be used to search automatically and sort through incoming information from different parts of the world? What is the role of IT in helping the firm ensure intelligence is effectively distributed and used throughout the enterprise?

The expanding field of information retrieval methods provides a fertile ground for applications-oriented research in the MNC. Yet, the hints in the literature suggesting that Japanese multinationals may be far better at the systematic collection and utilization of corporate intelligence should increase the urgency of this area of research in Europe and the Americas.

4.3. Internalization

The use of internalization criteria draws the research focus towards the economic drivers of each business transaction. Information systems, such as those in equity, foreign exchange trading, or airline reservations, are optimized for quick response time and the minimization of transactions costs.

If internalization theory is correct, information technology may be one of the primary tools used to drive the expansion of the economic sphere of the firm. The theory suggests internal information-based operations of the MNC should be compared on a cost basis against those of the market. In such a measurement, the role of information technology needs to be examined to determine its role in lowering the cost of each intra-firm transaction. In contrast, any event which suddenly raises processing costs should be disruptive to firm growth. Such an event might occur when one firm absorbs another, as in a merger or takeover.

Many questions need to be answered. How can information systems be used to lower transactions costs and thereby power the expansion of the firm against the competition, i.e. what are the optimum system design specifications? How do we measure and what do we measure to ensure the best solution has been chosen?

Can information systems help to re-design business processes so that the velocity of information within the firm increases? If so, then what techniques can be developed to assess how the complex layers of systems can reduce those trade-supporting transaction costs?

Research also needs to uncover how reductions in transaction costs actually translate into acquisition or stabilization of foreign investment activities, as has

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2 Rapid progress is being made in automatic scanning and routing of incoming electronic mail messages, with significant potential application to corporate intelligence systems.
been suggested by international business theory. Drawing clear conclusions on this point can not be easy.

4.4. Firm specific advantages

The competitive advantage literature needs to be extended, yet it must be determined which aspects of the known theory can be applied to the multinational corporation. Should IT be viewed as being an integrated whole, rather than many different geographically isolated parts? If it is viewed as a whole, then how can we account for (identify, analyze, measure, anticipate) competitive effects spanning international boundaries?

We are drawn to consider if FSAs can be generated directly through information technology. This subset could be called 'information technology-based FSAs'. IT/FSAs have never been studied in any detail, although there are strong indications they exist. They may be rising in importance as national barriers continue to erode. If the task of strategic systems development is to master the way competitive projection into foreign territory takes place, then the methods to understand what specific components of competitive advantage are accounted for by these types of information systems – in contrast to other competitive forces such as marketing, design, technology, manufacturing, capital, management skill or other assets – are not well understood and need to become the subject of an intensive research effort. Can IT be the primary source of FSA in a national market, or only act in a support role aiding the MNC as it maximizes the advantages it possesses from other sources? How could we measure the difference?

How can systems be designed to cut out the inflexibility which might cripple a contemplated strike at territory held by weaker forces? How many cases of IT/FSAs can be uncovered? What are the enabling factors making possible this type of strategic projection? What are the best analytical methods to match potential strategic applications against the characteristics of host national environments? In other words, how would one pick 'targets'?

Research should vigorously study places where systems already developed in one location can be projected geographically to yield swift advantage in foreign markets. The study of how IT-generated competitive effects can be transmitted throughout the multinational by any reckoning is an exciting and potentially useful line of research.

4.5. Host country relations

The obvious need to strike a balance between nation state-imposed restrictions and available business opportunities suggests that when designing and configuring international information systems, a MNC might ignore the peculiarities of national markets and practices only at its peril. Attempting to build systems based on efficiency alone and ignoring political and cultural considerations can lead to impossible and damaging conflicts with host governments as restrictions on the information system are used to accomplish national policy objectives which can not be pursued openly by other means.
Examination of how host countries regulate MNC uses of information technology is not one of the traditional areas of MIS research. Nevertheless, many unanswered questions are raised: What are the economic and business effects of host country restrictions? How can they be accurately measured? Can nation state controls be used as non-tariff barriers to trade and if so, how much trade aversion takes place? What types of architectures are best suited to coping with nation state demands? What types of skills within the IS function are most required to plan and manage around host country restrictions?

It is easy to imagine how those management and technical challenges imposed by host country–MNC conflicts could place the IS function center stage in developing a national (‘local’) business strategy. We can see the disastrous results when multi-nationals choosing the wrong persons to handle host government matters are subjected to a variety of government-imposed restrictions such as bureaucratic delays, additional restrictions or prohibitive taxes. We need to learn more about how managers can prepare to cope with these host country environments as they proceed to hire and train appropriate personnel and adjust system development efforts to boost sensitivity to host government concerns.

4.6. Additional questions

There are also several infrastructure questions not accounted for by recourse to international business theories:

- **Data center consolidation.** Why has IBM been reducing the number of data centers in Europe from several hundred to between eight and 12, with plans to reduce them eventually to only two or three? Why did Manufacturers Hanover Trust do the same, and why is a major pharmaceutical company also following this path? The very radical changes which occur in the IT infrastructure as a result of consolidation need to be studied to determine the basis of their competitive effects and their impact on host country relations.
  
  What are the economic forces driving data center consolidation? What are the business and strategy drivers leading to data center consolidation and what are the underlying technological forces? To what extent is data center consolidation taking place across sectors and across international borders?

- **New architectures.** The rapid development of the client server architecture model fuelled by developments in RISC microprocessors has yet to be studied with reference to the emerging IT infrastructures of the 1990s multinational. What are the implications for systems development if the continued existence of mainframe architecture is as stark as it appears to be? Will large companies really abandon all forms of centralization? Will the mainframe become a caltrop deflating every effort at reform, or does the recent surge in mainframe sales signal renewed efforts at centralization? How is the distribution and use of IT within the multinational changing? For example, will the development of client–server architecture continue to squeeze mid-sized systems so that the MNC adopts a mainframe-centered approach with connections directly to local LANs, thereby making obsolete the
predominance of mid-sized machines we have seen in the past (particularly in foreign subsidiaries)? Alternatively, will client server architecture provide a path to decentralize further – ‘localize’ – data processing better to build the multicultural context needed for conducting today’s business? Are we sure these changes at the technology level will automatically have a meaningful impact on headquarters–subsidiary relationships or strategy?

5. In summary

Today’s multinational corporation opens up a vast area of potential research. In the past, MIS writers have considered for the most part important theories such as competitive advantage and interorganizational systems within the context of domestic systems only. With a few exceptions, multinational corporations have been ignored in spite of their vast data processing establishments. Several theories from international business can be used as reference points to generate a body of research questions which beg to be answered in the near future.

The complexity and scale of the information systems being studied presents a stiff challenge to future research, without which, however, some of the most important actors in the world economy will remain misunderstood.

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