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# **ELECTRONIC DATA INTERCHANGE: PLATFORM FOR A STRATEGIC BUSINESS FOCUS<sup>1</sup>**

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## **ABSTRACT**

Early research into EDI stressed the greater speed, efficiencies and cost savings available from electronic document exchange and, despite EDI's cooperative focus, much of this research also described the technology as a **competitive weapon** for user organisations. Wider experience with EDI suggests, however, that rather than looking for short-term competitive advantages from EDI, it is in the areas of systems integration and business re-engineering that EDI offers its greatest real benefits. This integration enables EDI to support a truly strategic approach to business, offering major **comparative** advantages to organisations, business groups, industry sectors and trading blocs.

The paper develops a model of EDI integration as a series of standard and recurring stages:

- ! stage 1 involves a PC with EDI software
- ! stage 2 is sub-divided into two alternatives:-
  - 2(a) involves a link between the PC software and in-house mainframe software
  - 2(b) moves the EDI software onto the mainframe itself
- ! stage 3 provides seamless integration between EDI transactions and application software
- ! stage 4 involves organisational restructuring to use EDI as the enabling platform for a wholly integrated information flow.

The paper then considers the case of a major Western Australian public sector organisation which is in the process of making EDI a vehicle for business re-engineering (as in stage 4, above). The paper suggests that, while EDI itself is a comparatively simple technology, the implications of its strategic use as an enabler of major organisational restructure are profound.

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## INTRODUCTION

### Competitive Weapon or Cooperative Platform

Industry conferences and journal articles frequently describe EDI as providing a "competitive edge" for its users (e.g. Robinson and Stanton, 1987; Langton, 1988; Hudson, 1989). While short-term competitive advantage from EDI is possible for an organisation which is the first in its market sector to link in suppliers, the arrival of competitors rapidly erodes any possibility of "sustainable" competitive advantage (Clemons, 1986). Some instances of sustainable competitive advantage through EDI **do** exist, but these appear to be more likely where:

- ! EDI is a factor in a substantial gain in market share being made and retained, particularly if some competitors are forced to withdraw from the market, e.g. the U.S. airline industry's reservation systems SABRE and APOLLO (see Cash, 1985; or Copeland and McKenney, 1988);
- ! alliances are formed which provide dominance over a market, e.g. the international banking community's closed-user-group SWIFT clearing-house (see Brearley, 1989; Swatman and Clarke, 1990), or the European airline reservation clearing-house SITA (see Amerongen, 1987); and/or
- ! the market is substantially re-defined in the initiating organisation's favour, e.g. the American Hospital Supply Company (now Baxter Healthcare Corp.) ASAP on-line ordering system (see Harvard Business School Case, 1985; 1988).

It is noticeable that, with the exceptions of the SWIFT and SITA clearing-houses, which clearly fall within the commonly cited definitions of EDI (see, for example, Coathup, 1988; Rochester, 1989; Metzgen, 1990), the majority of the examples of sustainable competitive advantage of this type relate to systems which many observers would consider only border-line EDI at best.

In most cases of this type, the innovator's advantage is fairly quickly neutralised, either because the original competitive scheme is replaced by a more successful cooperative venture, or because the innovators are forced by competitors or regulatory agencies to make the services widely available. The successful implementation of cooperative EDI schemes within such fiercely competitive market sectors as the automotive and pharmaceutical industries (see McNurlin, 1987; Hollands, 1988; Hill, 1988; 1989) implies that corporations view EDI as a factor in their industries' survival, rather than as a competitive weapon. In fact, the competitive SWIFT venture is itself an example of cooperation by the banking industry, to protect its market share against the rapidly expanding non-bank financial institution sector (Burns, 1989; Brearley, 1989).

This failure to provide long-term sustainable competitive advantage implies that EDI, despite its strategic importance, is essentially a *cooperative* phenomenon: "implicit in the early writings on EDI has been the assumption that these systems hold great potential for providing strategic advantage ... [but] EDI applications, rather than being a competitive weapon, are increasingly a necessary way of doing business" (Benjamin et al, 1990. See also McNurlin, 1987; Rochester, 1989; Swatman and Clarke, 1990). EDI's competitive advantages relate to its integration into internal systems and structure - to business re-engineering.

## Benefits of EDI

The direct impacts of EDI include labour-savings in the areas of data transcription, controls, and error investigation and correction; and fewer delays in data-handling. Lists of the resultant benefits which are to be found in the business literature have tended to be remarkably similar, although more recent writers have begun to refer to EDI benefits in terms of their strategic/tactical potential. Annis (1992), for instance, provides the following list:

*Strategic* EDI benefits include the ability to:-

- ! enable implementation of cost-reduction programmes (e.g. JIT/QR)
- ! provide support for maintenance or improvement of market share
- ! improve certain business services significantly
- ! enable business units to expand the use of computer applications.

*Tactical* EDI benefits include:-

- ! faster and more efficient information exchange with trading partners
- ! improved quality - reduction of errors, omissions and lost or misplaced documents
- ! increased productivity
- ! reduced out-of-pocket expenses (labour, printing, postage, faxing, filing).

As organisations gain greater experience with EDI, the more far-sighted users have realised that significant benefits are to be gained through the integration of related functions across organisational boundaries. It is not the replacement of electronic messaging for formerly paper-based communications which provides EDI's major strategic capabilities, but the associated changes in operation and function within and between organisations, made possible by EDI links: "if ... one uses EDI simply to automate the same processes one used to do, the effects will be moderate and EDI will not be exploited to its full potential" (Sheombar and Wagenaar, 1991:208).

An example of business re-engineering through EDI is found in Rochester (1989). He cites the case of Levi Strauss which, by means of its Quick Response system LeviLink, has achieved a complete vertical integration of the company's entire apparel manufacturing and marketing cycle (including the replenishment of inventory, the management and reconciliation of purchase orders, the receipt of goods, the processing and payment of invoices, the capture of point-of-sale information and the analysis of market trends). The management of Levi Strauss sees EDI as a unifying factor in the organisation's use of Quick Response technology (DuBois, 1990), providing the company with a significant edge in a highly competitive market-place.

This focus on achieving integration **across** organisational functions and **between** organisations is what distinguishes EDI from other forms of electronic transaction (such as electronic mail) and makes EDI an effective platform for strategic re-engineering of the organisation.

This paper will initially consider the principle of EDI systems integration, considering the likelihood that integration with internal application systems can be defined as a series of standard and recurring stages. Case study research has provided support for this view and indicates that such integration does, indeed, occur in a relatively standard manner for the majority of EDI-using organisations.

The paper will continue the investigation of strategic integration between EDI and functional restructure by considering a major Western Australian public sector organisation which is in the process of making EDI a vehicle for business re-engineering. Building on the findings of the earlier research into consistent patterns of EDI integration, this organisation is creating an integrated system of applications and structures based upon an EDI infra-structure. Finally we suggest that, while EDI itself is a comparatively simple technology, the implications of its strategic use as an enabler of major organisational restructure are profound.

## **EDI SYSTEM INTEGRATION**

Strategic benefits attributable to EDI depend upon two forms of integration:

- ! integration of information received from external sources with existing organisational systems and practices; and
- ! integration of the internal organisational systems and practices themselves, which can change the entire structure of the organisation.

While the first of these forms of integration has already received some attention in academic and industry journals (Boucher, 1989; Skagen, 1989; Thavasuthan, 1990; [Benjamin et al, 1990](#); [Payne and Anderson, 1991](#); Rynne, 1992), it is less common to see EDI regarded as a facilitator of business re-engineering ([Sheombar and Wagenaar, 1991](#); Swatman and Swatman, 1991c).

### **Integration with Existing Organisational Systems and Practices**

Figure 1 (below) shows that EDI software performs two quite disparate tasks - and thus can be sub-divided into two separate categories:

- ! in-house interface software, which translates outgoing information from unstructured, company-specific formats into structured EDI formats (such as ANSI X12 or EDIFACT) and places these structured documents in an electronic "out-tray" (and, of course, deals with incoming structured documents in an analogous manner); and
- ! network communications software, which transmits the now structured message to its recipient (using data communications standards such as OSI). For an extended discussion of this topic, see Swatman, Swatman and Duke (1991).

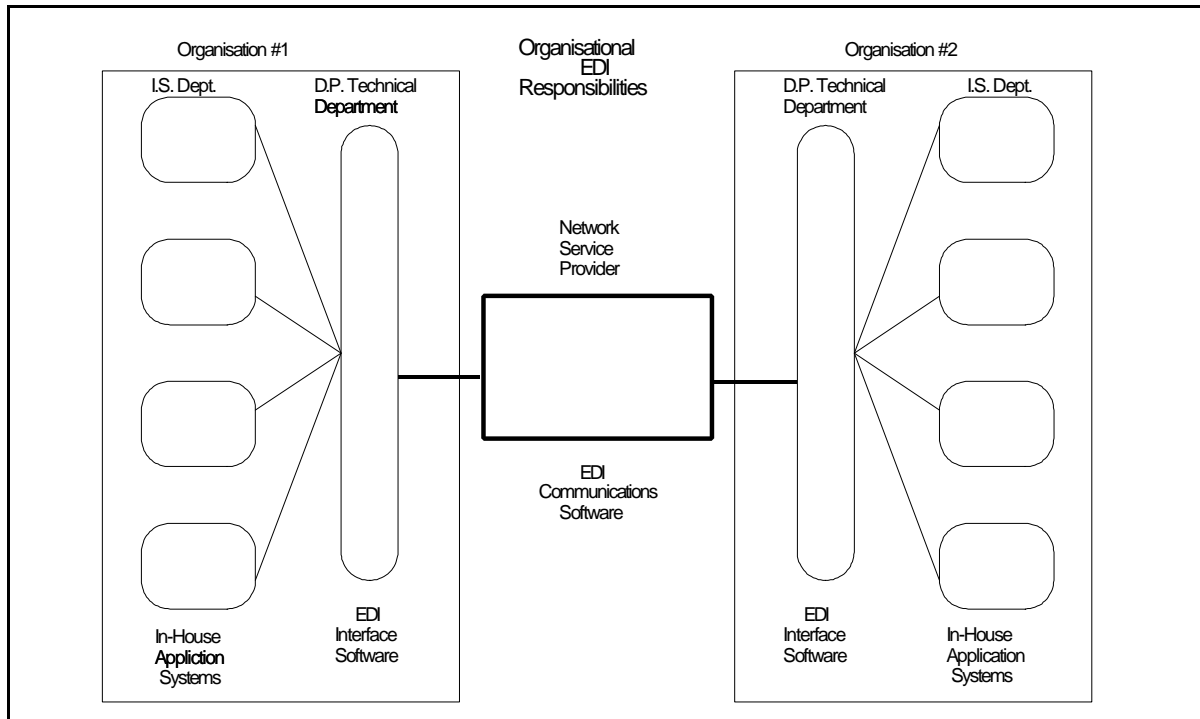


Figure 1 - EDI Software Categories

While many prospective EDI users concentrate on the communications software (which is generally provided by third-party network suppliers in any case), it is in the domain of the in-house interface software that the greatest potential for strategic benefit in the form of comparative advantage may be found.

Linking EDI messages with in-house systems can improve an organisation's internal operations - reducing or eliminating administrative overheads such as overtime premiums, overnight courier charges, late/incorrect shipments from suppliers, excess inventories, poor forecasting, disruptive production schedules and incorrect order entry (Skagen 1989). The long-term strategic importance of EDI lies in the potential *comparative* advantage to be gained from its use:

*"those who do gain significant competitive advantage from EDI will do so by learning how to integrate the technology effectively into their organisations in such a way that they can continually add valuable new capabilities to the system, while deriving cost savings from increased productivity and decreased overhead made possible by EDI"* (Benjamin et al, 1990:39).

EDI in its simplest form (as a replacement for paper-based document flows) is little more than a rapid electronic mail service. Boucher (1989) points out that significant changes to commercial operations only occur with the integration of EDI into internal application systems, allowing a seamless connection to functions such as purchasing, order entry, shipping, inventory management and accounts payable and receivable. Payne and Anderson (1990) see these links as equally critical to the U.S. Defense Department's operations:

*"most DoD EDI applications are not well integrated into DoD's internal logistics management systems. In addition to lacking interfaces to receive transactions electronically, few of these internal systems, either existing or planned, are designed to take advantage of electronic transaction exchange, including the use of electronic agents. The lack of such internal system capabilities impedes the flow of information between EDI transactions and internal systems while hampering managers' efforts to exploit EDI's potential advantages" (Payne and Anderson, 1990:62/3).*

The need for integration between differing types of electronic information is also starting to receive attention (Ellinger, 1989; Lloyd, 1992). A tutorial from the U.S. TDCC group points to additional benefits available from links between EDI and other electronic communications:

*"EDI is essentially the leading application which is driving companies to link electronically to automate their business dealings. But once these electronic communications links are in place, companies should consider how to leverage them for other applications as well ... While adding external information is one way to differentiate an EDI system, other forms of differentiation involve the integration of non-character information, such as graphics, images and voice systems. Companies regularly exchange engineering drawings, pictures and other types of information not covered by EDI standards" (Watkins and Taylor, 1988:21/22).*

The range and variety of these quotations provides some indication that the concept of linking EDI with other, internal application systems is growing in popularity. Many of these authors also suggest that linking internal systems in this way also increases the efficiency and effectiveness of the organisation. What is less evident is the suggestion that this process of integration can be used as a springboard for a total restructuring of the organisation.

### **Integration of Overall Business Practice**

The benefits offered by internal systems integration are significant in themselves, but still more significant long-term changes in strategy and competitive position can be built upon the technical foundation provided by system integration (see, for example, discussions in Somogyi and Galliers, 1987; [Dampney and Andrews, 1989](#); [Davenport and Short, 1990](#)). Such strategic opportunities arise from changes in the organisation's view of its structure and functions: "the impact of technological change depends on why and how technology is used. As management had now a definite choice in the use of technology, the technological choices could be evaluated within the context of business and organisational choices, using a planned approach" (Somogyi and Galliers, 1987:19).

EDI provides a technical infrastructure upon which such re-engineering of the organisation can be supported. An appropriate model for EDI-based business re-engineering is the Enterprise-wide Information Management (EwIM) model (first defined in [Benson and Parker, 1985](#) - and extended in a number of books and articles, including Parker and Benson, with Trainor 1988; Parker and Benson, 1989; [Parker, Trainor and Benson 1989](#)).

*"The premise of EwIM is that it is possible to plan effectively for the use of information technology in business by linking technology planning to business planning. With this premise, EwIM has developed an intellectual framework that links various planning approaches and concepts and produces a relevant, rational and workable approach to long-range planning. The key is the dual recognition that business and technology planning should be linked and that business planning should drive the technology planning" (Parker and Benson, 1989:15).*

EwIM considers firms from two perspectives - the business activities carried out by the enterprise, together with the technology which supports these business activities - and classifies the planning activities undertaken in both these *domains*:

! business domain planning, which itself falls into two categories:

- portfolio planning to assist in the allocation of resources and
- business strategy planning (after Porter), which attempts to use the line of business as a basis for strategic thrusts into the marketplace

! technology domain planning, essentially based on architecture/ infrastructure.

EwIM permits a synergistic approach to the links between these two foci and leads to the development of an action plan enabling a contingency-based attitude to the planning process.

The additional dimension which EDI adds to this model is the facility to link business systems in a seamless fashion. The internationally-agreed standards for document translation (which are EDI's single most important factor) provide the consistent link between application systems no matter how or from whom derived (see Swatman, Swatman and Fowler (1991) for a more detailed discussion of this issue).

Although EDI itself offers little that is new in a technological sense (the majority of EDI schemes use comparatively old-fashioned batch technology), the ability to link input/output from a variety of application systems provides the underpinning needed for a revised view of the organisation's information needs. There is no longer a requirement to design information systems on the basis of paper-based information flows.

This view of EDI's potential for re-engineering is supported by the existing European experience:

*"I suggest you look particularly hard at **intra**-company activity, and look beyond purely paperless trading for the early international paybacks ... the most successful users of EDI don't mind joining industry clubs and sharing the benefits of intercompany EDI, because they have usually got massive organisational restructuring and internal information systems plans to exploit the situation competitively" (Wilmot 1988:17).*

## **A MODEL OF EDI SYSTEM INTEGRATION**

The statement that "EDI is 90% business and 10% technology" has now become almost an article of faith within the EDI community. Indeed, a wide variety of writers within both the trade and academic sectors provide support for the view that EDI should be regarded as a strategic issue, rather than as a technical problem (see, for example, Sadwani and Sarhan



1987; Robinson and Stanton 1987; Patrick 1988; Lyttle 1988; Skagen 1989; Rochester 1989; Emmelhainz 1990; Swatman and Swatman 1991a; 1991b). While there has been no lack of propounders of this concept, however, there has been little research into the actual process of integrating EDI (Swatman and Swatman, 1992).

The comparatively limited nature of the attempts to validate this view of strategic EDI is partly due to the difficulties of perceiving EDI's technical aspects separately from the organisational issues of implementation and integration. Prospective users of EDI have tended to view both aspects of the total EDI system as falling within the domain of their own I.S. department and, since the creation of an EDI communications system is unquestionably a complex and difficult task, it is not surprising that they have recoiled from contemplation of the issues involved in integrating EDI into their own organisation (although in Swatman, Swatman and Duke (1991) the formal specification of an EDI communications system showed that the requirements of the inter-organisational communications functions of EDI are entirely separate from the requirements of the in-house EDI system).

A research approach which seemed to offer real possibilities was to determine the significance of integration with internal application systems, so that this aspect might be separated from the broader question of organisational restructure. A multi-phase research programme was developed, attempting to isolate the various aspects of this question (this research project is described in detail in Swatman and Swatman, 1991c).

The series of case studies of Australian EDI-using organisations resulted in a model of the stages of EDI systems integration:

1. In the first stage, there is a PC with EDI software (translation and communication), requiring:
  - ! a member of staff to key in outgoing EDIFACT/X12 messages;
  - ! the printing of incoming EDIFACT/X12 messages.
2. The second stage is composed of two alternate paths, either:
  - 2a files created by the mainframe/mini application systems down-loaded to a PC having the EDI translation and communications software (with, of course, analogous facilities for incoming EDI messages). This replaces the keying-in and printing-out of messages with flat files, speeding up the process and making incoming messages (in particular) more useful, since they do not require rekeying prior to use by another system.
  - 2b the EDI software is itself based on a mainframe/mini computer. This is similar to the process described in 2a, save that the physical uploading/downloading is also eliminated.

2a and 2b are essentially the same stage of integration, since the physical location of the EDI translation/communication software is of little importance. The difference between these sub-stages is therefore merely technical in nature (rather than organisational).

3. Seamless integration between EDI transactions and production applications such as purchasing, order entry, production scheduling, inventory management, accounts receivable/payable, shipping and so on.
4. A final stage of integration, in which EDI is seen as an integral part of the organisational context and is a major factor in strategic and information systems planning. This final, organisationally-centred stage results in the use of EDI links to influence the functional structure of the organisation and the structure of the supportive information systems within the organisation.

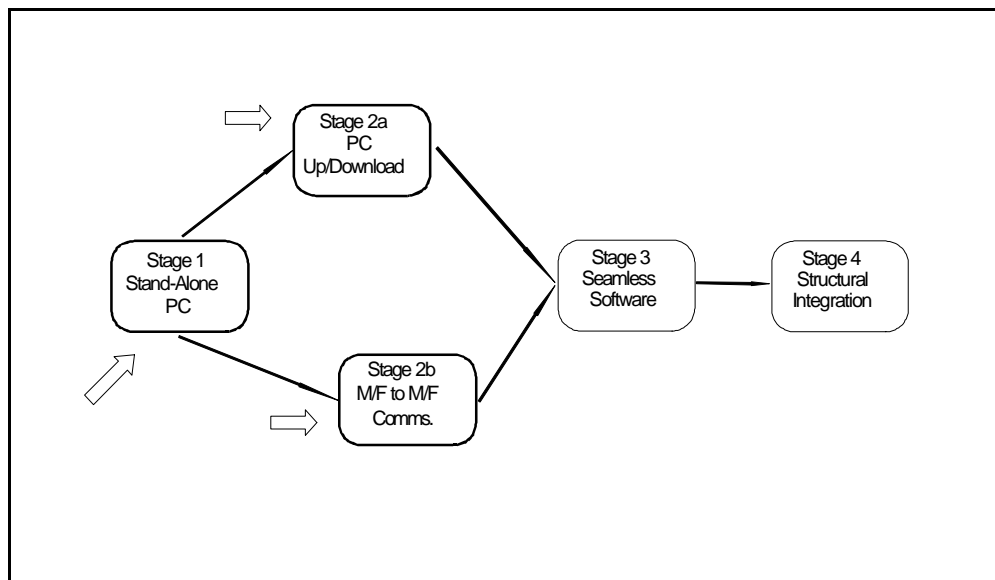


Figure 2 - Final Model of the Stages of EDI Integration

Membership of an EDI scheme, *per se*, appears to provide no impetus towards integration within the organisation:

- ! those organisations which progressed fairly rapidly through the model were either the initiating organisation or had participated in the original pilot stage of the scheme in question, suggesting a proactive approach to EDI;
- ! the participant/schemes which neither progressed (nor planned to progress) towards integration were all non-initiating members of EDI schemes.

These findings suggested an extremely strong correlation between the initiation of the EDI scheme and progression through the stages of integration - indeed, only one non-initiating participant showed progress (and that organisation was an active participant in the pilot scheme).

Although at the time the research was undertaken (late 1990/early 1991) EDI was in its comparatively early stages in Australia, later extension of EDI schemes has shown that

organisations which are initiators of one scheme tend to apply their proactive attitude towards any other schemes of which they may later become members. It thus appears that the integration process is driven by the same factor which drives the *initiation* of an EDI scheme - an organisational perception that EDI is a natural extension of pre-existing internal operations. This does not mean that only initiators of EDI systems gain comparative advantage from integration, but that organisations joining pre-existing EDI schemes must take a top-down, strategic view if the benefits of comparative advantage are to be gained.

There was a significant difference between the experience of that group of respondents developing their first inter-organisational system and those building on prior experience in this area. While the hypothesised stages of integration (and the progress through these stages) was borne out by all respondents to the study, more mature organisations entered the model at higher levels and progressed both faster and further. Those organisations entering the model at higher levels appeared to be "piggy-backing" on the experience of other EDI implementations with which they were involved. A significant number of case study participants had started work on more than one EDI scheme over a very short period and were thus able to incorporate the experience gained from earlier attempts.

The factor which proved to have the greatest influence on progress through the stages of the model was an organisational perspective of EDI. Comments made by interviewees suggest that the motivation for the integration process is a strategic perception of EDI as a natural extension of pre-existing internal operations. While non-initiating participants in EDI schemes have the ability to gain long-term comparative advantage from system integration, they frequently fail to take a top-down, strategic view which incorporates EDI. EDI systems are initiated by organisations which view the inter-organisational communication involved as central to their way of doing business and are therefore naturally inclined to integrate their IOSs with their existing internal systems.

The development of a model of EDI system integration provided support for the theories of EDI's strategic role. It was apparent that those organisations willing to use EDI as a platform for business re-engineering could hope to achieve significant advantages not readily available to less innovative competitors. The EDI Research Group at Curtin has been involved with one such organisation.

## **STRATEGIC EDI IMPLEMENTATION - A CASE STUDY**

The Western Australian Department of State Services (DoSS) provides an example of an organisation considering the use of EDI from a strategic viewpoint. Their strategic plans for EDI are based upon a public sector procurement information system known as Supplynet.

### **Supplynet**

Supplynet is a telecommunications-based information system. Developed by the Department of State Services in conjunction with Telecom Australia's value-added service provider Telecom Plus, Supplynet was designed to facilitate better, more cost effective government

procurement by providing an interactive link between the State Government (as a purchaser) and its suppliers (WA Govt, 1991).

At present, Supplynet offers information on Western Australian State Government tenders, period contracts, historical purchasing information and forward procurement plans, together with an industry knowledge base and directories of government purchasing contacts and supplier capabilities/catalogues. Information is also available on Commonwealth Government tenders and both Australian and New Zealand Defence Department forward procurement plans.

### **The Incorporation of EDI into Supplynet**

Two of the original primary objectives of Supplynet were:

- ! to enable government agencies to achieve more effective purchasing by giving them ready access to up-to-date information on suppliers and their capabilities/prices; and
- ! to assist suppliers (particularly small, locally-based businesses) by providing easy access to relevant government purchasing information.

Supplynet development is now at a point where these objectives have been realised to a great extent. While ongoing enhancements to the Supplynet database will continue to be made, the major focus is now on achieving the next, perhaps more significant, planned objective for Supplynet - that of providing an electronic purchasing service throughout the State Government by means of EDI.

Integrating EDI into the internal purchasing systems of State government agencies offers substantial benefits to the public sector - including reduced costs and faster, more efficient/effective purchasing on a whole-of-government scale. In addition, as the first whole-of-government Electronic Trading system to be developed and implemented in Australia, Supplynet has tremendous potential not only to enhance the State's entire procurement process, but also to influence future development of EDI systems and their integration throughout the Federal, and other State governments. This potential has been recognised by the Victorian State Government, which has also adopted Supplynet.

In view of the substantial potential benefits and consequences of the project, the Department of State Services has taken a top-down, strategic approach to guiding the development of Supplynet. High level management within the State government (not only within DoSS but other critical areas such as Treasury) see EDI as a strategic platform which will enable them to achieve seamless, integrated, electronic procurement across the whole of government. This support and involvement has been, and will continue to be, critical to the successful development of Supplynet.

### **Supplynet Development**

DoSS foreshadowed the actual introduction of EDI via Supplynet by concentrating on raising the level of awareness of EDI and Electronic Trading throughout the State. The strategic plan prepared for Supplynet was released as part of the overall State Supply Strategy, and actually

made up the first public document outlining the government's intentions for EDI and Electronic Trading (see WA Govt (1991)).

DoSS is currently undertaking the next phase associated with making EDI facilities available through Supplynet - that of trialing sample documents. ANSI X12 Purchase Orders (document 850) may now be sent by government agencies using the existing non-EDI Common Use Purchasing System (CUPS) to suppliers connected to Supplynet. The Purchase Order was chosen as the first document to be made available because its transmission was identified as the facility most needed by Supplynet users. Further documents will be trialed and made available, one at a time. Additional documents presently planned are the Purchase Order Acknowledgment (855), Request for Quotation (840) and Quotation Response (843). At present only ANSI X12 documents are being used, although a migration path to UN-EDIFACT is planned for the future.

Once these documents are available on Supplynet, DoSS will concentrate on the next forecast stage for Supplynet - the implementation of EFT facilities. Funds transfer facilities will provide the ability to achieve a seamless government procurement process.

The degree to which this goal is realised will in turn depend on the degree to which the government is able to use EDI as a platform to re-engineer the functions associated with the procurement process; and to enable the redesign and restructure of the existing processes involved in government purchasing.

In terms of the model of EDI integration described above, the majority of government departments are presently at stage 2b (most suppliers are at stage 2a) and the change to stage 3 has already begun. Current Supplynet development, however, is already beginning to take on the qualities of stage 4 integration. Recent work has focused not only on making purchase orders available through Supplynet but, even more importantly, on re-designing CUPS (the existing government purchase system) to enable the look-up of supplier information and the posting of purchase documents via CUPS/Supplynet integration. This link will enable purchasing officers to send purchase orders electronically to suppliers having the necessary receipt facility, using Supplynet but from within CUPS.

If the anticipated result of Supplynet's development is fully realised, the Western Australian government will have obtained an integrated, whole-of-government electronic purchasing system by 1994. Regardless of the degree to which this objective is accomplished, it is certain that little of what has been accomplished would have been possible without:

- ! a strategic plan outlining an EDI-based development for Supplynet and
- ! the support of high level management within the government.

It is equally certain that future benefits to be gained from Supplynet will be limited by the degree to which the government's existing procurement systems are re-engineered to take full advantage of the potential EDI offers as a platform for strategic re-development.

## CONCLUSION

As organisations move from the data processing model of information management (Somogyi and Galliers, 1987) towards a coherent, well-planned and integrated view of their information flows, there is a co-existing need for a technical infrastructure which can link their often disparate application systems. EDI offers such a technical infrastructure - and can therefore be seen as a platform upon which strategic business re-engineering can be based.

The need for total integration is, for example, well recognised in industry:

- ! in the manufacturing sector EDI-based Just-in-Time (JIT) inventory management systems offer a means of greater efficiency: "JIT is not an implementation in itself. It is a way of thinking about the manufacturing process. It tells what is good and what is bad within the factory and how factory and products should be designed" (van der Laan, 1991:43);
- ! in the retail industry Quick Response (QR) systems utilising EDI depend for their success on connectivity: "every stage in the retail chain, from production to sales, must be able to link in to achieve the turnaround and productivity improvements sought ... to get maximum benefit from EDI, an order must flow right through a vendor's system, right to the distribution centre, without being re-entered or manipulated manually" (Spriggs 1989:28).

One could imagine that all proactive EDI initiators would design their systems from the top down, considering the long-term implications for organisational work practices and functions. Case study research, however (Emmelhainz, 1987; [Benjamin et al, 1990](#); Swatman and Swatman, 1991a) seems to suggest that EDI systems are developed as and when needed. A coordinated and holistic view of EDI is either added later - or simply never happens. Reactive EDI users are even less likely than proactive users to have considered the matter from a centralised or strategic viewpoint.

The problems of information systems integration are not, of course, unique to EDI - all information systems affect the way in which organisations go about their business (for example, the move to corporate databases). What does appear to be different about EDI developments is their lack of incorporation into existing I.S. planning processes - even in organisations where there are well-established strategic planning departments.

One reason for this "bottom-up" approach to EDI implementation may be a desire to minimise potential organisational conflict by "sneaking" EDI into a company or agency:

*"as part of their strategy to gain organisational acceptance of the systems, developers in all three [case examples] intentionally minimised any changes in the work processes affected by these systems. This virtually eliminated resistance to the project within the organisation, but it also meant the benefits, and specifically cost savings, derived from the systems were minimal, making it more difficult to justify expansion" ([Benjamin et al, 1990:38](#)).*

Another possible explanation is that value-added networks, trying to extend their market penetration, often persuade organisations to "trial" an EDI system, which later becomes incorporated into company operations without having passed through the planning process. While both these explanations are readily comprehensible, it is imperative that potential EDI users take a proactive stance - at least where their own internal processes are concerned!

The major implications of EDI use lie in an inter-organisational context. In some industry sectors, particularly where cartel conditions already exist, EDI may be used to entrench an existing industry structure (the banking sector's SWIFT scheme, for example). Even here, however, there is a move towards cooperation among the wider community of EDI users, in that SWIFT now supports the concept of the universal EDIFACT document standards, and is gradually moving its own messaging standards towards compliance with EDIFACT.

Many EDI schemes have been developed within particular industry sectors. The quickly-emerging trade EDI systems, on the other hand, transcend sectoral boundaries, and link all aspects of import/export from the manufacturer of the goods, through the customs/shipping/freight forwarding/insurance agents who handle the details of the shipment and the various government agencies which are involved with trade, to the banks financing the shipment and the airfreight/ shipping company which actually transports the goods. The same process occurs at the receiving end, with wholesalers and retailers adding to the list of industry groups concerned. This inter-linking of industry sectors appears likely to be a potent force for the re-definition of industry sector boundaries:

*"Whatever short term moves are made, it seems likely that the longer-term trend will be towards communities of companies which trade with one another, within industry sectors, which will adopt standards and agree to cooperate on a technical level. It is also likely that these communities will become international and will gradually merge with one another"* (Patrick, 1988:231).

The organisational re-engineering process which has been the focus of this paper can therefore be extended to incorporate the inter-organisational and inter-sectoral "meta-organisation" which makes up the entire trading process. A number of authors (including Metzgen 1990; Wrigley, 1991; Botherway 1992) have suggested that EDI is a suitable medium for inter-organisational re-engineering. The Western Australian Supplynet project provides an example of how a group of organisations can hope to improve their overall efficiency and effectiveness by restructuring existing methods of doing business and lends credence to this suggestion.

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