



IT Case study

Electronic trading using the CITE invoice standard: Hanson Aggregates

This case study will be of interest to contractors, suppliers and manufacturers who would benefit from a reduction in manual data processing and closer partnering during the procurement process.

The study shows how electronic invoices can be exchanged between companies using a standardised electronic format. The implementation described could equally apply to other trading

documents including quotations, orders or despatch notes. The electronic documents conform to an international data standard.

Electronic trading using the CITE invoice standard

Hanson Aggregates (formerly ARC) introduced electronic invoicing during 1997 with their cement suppliers. The invoice exchange system used was that developed under the Construction Industry Trading Electronically (CITE) initiative.

Note: throughout the study, reference is made to Hanson Aggregates, though for much of the time covered by this case study, the company was trading as ARC.

Objective

- To receive invoices electronically in a way that they can be integrated directly into the accounts software, cutting out the manual invoice registration operations.

Approach

- The process was initially implemented in the company's 'central' region and then subsequently replicated in the 'southern' region.
- Having initially established a link with one supplier, further links were soon established.

- The challenge now is to increase the number of trading partners and extend the scope of the electronic trading activities to include orders and other messages.

Benefits

- Currently, the two regional offices process more than 2,500 electronic invoices each month. Although one of the pioneers of this approach in the construction industry, Hanson experienced few technical problems installing the required technology. Once operational, the system basically runs itself.
- Savings on time manually registering invoices.
- Information was also available earlier and without the risk of transcription errors.
- Further benefits come from the commercial value of closer links with key suppliers and from the confidence in data accuracy and fast availability.

Background

Within the construction industry, contractors, suppliers and manufacturers have collaborated to bring into use a common data transfer format together with the necessary implementation services.

Developments in the area of electronic business are providing new interchange options all the time. However, the business and management principles are fundamental to a successful implementation. This case study describes the experiences from one such implementation.

Replication

The exchange process described uses established and proven technology which is accessible to companies of all sizes. Although early implementers of electronic exchange have often been larger companies, small to medium-size enterprises (SMEs) could easily adopt the same approach. A core element is the use a common data format to integrate the different applications used by trading partners. The industry exchange standards described could be adopted by any company.

Ease of use

This case study provides a useful review of the difficulties experienced by one of the first companies to adopt the industry exchange standards. Like every new communication technology, the problems range from technical issues to finding someone with whom to communicate. Although the process today is easier to establish, the study helps to clearly identify all the issues that need to be considered.

Definitions

There is some confusion as to the meaning of the growing number of definitions used when referring to electronic information exchange. Unfortunately, there are no 'universal' definitions, though the following may be useful.

E-business

The expression 'e-business' or 'electronic business' is often interchanged with 'e-commerce', but is intended to describe the broader use and impact of electronic information exchange on the entire business process. Thus the scope of e-business would encompass electronic document exchange, electronic trading, electronic information systems, process modelling, re-engineering, and anything else related to the use of electronic exchange.

E-commerce

E-commerce (or electronic commerce) is the transacting of business, such as buying and selling, by electronic means. This includes all forms of electronic media but is increasingly used to define buying and selling goods on the Internet or world-wide web (www).

Electronic data interchange (EDI)

The electronic transfer of business information from one independent computer application to another independent computer application, using agreed standards to structure the data.

Electronic information exchange (EIE)

An inclusive term used to cover the whole spectrum of business applications that involve the transfer of information electronically between computer systems. This term is often adopted to avoid the problems caused by any narrow interpretations that are applied to, or inferred from, terms such as EDI, e-commerce.

The process

The end of the first phase of implementation of electronic invoicing was greeted by David Oatley, systems manager for Hanson Aggregates Central as follows:

“HUSSAR!!! and all that stuff. To an accompaniment of resounding cheers and popping champagne corks, on Monday 13 November 1996, we received our first 13(!) live invoices from Blue Circle Cement. Well, actually, they were processed through our purchase invoice processing system quite quietly in an overnight batch routine, and a confirmation report was waiting the following morning. However, we felt the event was certainly worthy of celebration, for it represented the culmination of over twelve months effort and involvement with CITE, Harbinger and our partners Blue Circle.”

The process had started with the agreement of a number of contractors and suppliers to ‘make electronic information exchange happen’. Collaboration was a key element of a

process that was intended to provide as much of a turnkey solution as possible.

Hanson’s first involvement with EDI began in the early 1990s when initial pilot schemes were developed (one of which was with Blue Circle Cement). Owing to company reorganisations, these schemes died or were at least consigned to the ‘pending tray’. Several of Hanson’s customers and suppliers had again contacted them with a view to establishing EDI partnerships – some even dangling the threat of removal from tender lists.

The emergence of the CITE initiative provided the catalyst to reactivate the project.

Within six months, the data exchange standard had been agreed and documented. It was defined as a true subset of the international UN/EDIFACT standard, controlled under the United Nations and the International Standards Organisation (ISO). By adopting a true subset (ie, adhering to the syntax rules) it

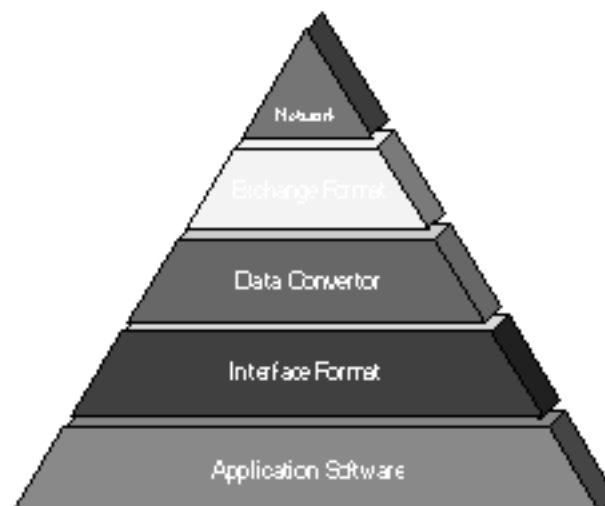
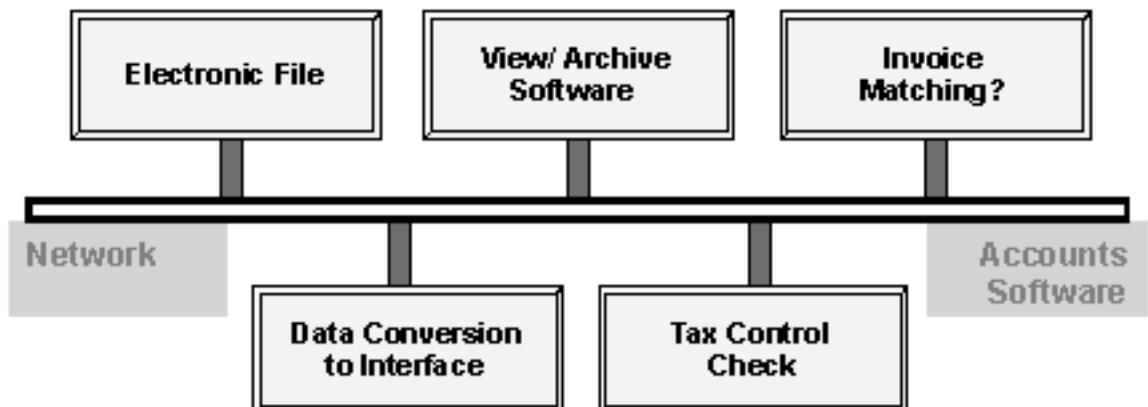


Figure 1 Electronic invoice exchange information flow

would be possible to trade across industry sectors, as well as internationally, using the same electronic format.

Having agreed the standard, the next step was to install the data exchange software and network services. A group of contractors had negotiated with a number of electronic data interchange (EDI) software and network providers. The result had been that Harbinger, a relative newcomer to the UK, was asked to provide a solution for the contractors which, understandably, was adopted by others involved in the initiative.

For reasons largely of economics, the Harbinger software, written to run under MS-DOS, was chosen. With a price of under £1000, this was an affordable solution, especially as the process still had to be proven. Coincidentally, as time has gone on, most companies have gone the same way. Even those like Hanson, who run applications on mainframe computers, are able to transfer files to and from the PC. It was also noted that this provided a degree of comfort for operational staff as the EDI components clearly sat in their own 'box', isolated from the main operating systems - a kind of data-exchange firewall.

Initial problems were due to the fact that the software had not been specifically designed to suit British methods of doing business. The UK Customs and Excise rules require that a supplemental message is exchanged with each batch of electronic invoices in order to confirm the correct transmission of the data. This functionality was written into the Harbinger software, as were other specific options that had been requested by CITE. This caused some initial delays but resulted in a product geared up to operate more closely to the requirements of the construction industry.

Beta testing a newly-defined product means that bugs will inevitably be encountered. The Harbinger support team worked hard at fixing them, finding work-arounds, or reporting them to their parent company in the States. The cycle of testing, fixing and installing new versions finally came to an end and Hanson, and others, had a compliant piece of software. As they were to be one of the first installations for the Harbinger system, Hanson arranged for a Harbinger engineer to phone them and monitor the process with them. However, so

eager was their PC support engineer to get things going that he had already loaded the software on the designated machine and would have set up the network connection had someone not restrained him.

The next stage in the process was to write an interface to integrate electronic invoices with their accounts package, CODA.

For Hanson to integrate the invoices with their software required a conversion (mapping) between the EDIFACT exchange format and a flat file. This is quite common as the transfer format is designed to be compacted and is highly rules-based. Software finds it easier to write to/from something like a flat file, where the data content is consistently located at known positions. The CITE approach was to provide a routine that could map data between these two formats, and for both to be standardised. Initially, Harbinger had provided a mapping for CITE invoices. However, as more messages were developed it was decided to adopt an independent mapping capability (using TSI Mercator software) which can be run with different EDI software and on different operating systems. Hanson used a DOS version of the software so that this could be automated using schedulers provided within the Harbinger software. The schedulers allow collecting, sending and processing electronic information to be controlled; by triggering 'batch' files, almost any process can be managed by this means.

Electronic invoice receipt

The first plan had been to send invoices to a number of contractors; with this in mind, Hanson wrote an outbound interface for their accounting system that would produce a flat file of sales invoices. But about half way through the year, it was apparent that delays with the contractors' internal developments meant they were not going to be in a position to make the live link as quickly as initially envisaged. Consequently, Hanson switched resources to developing the links to their purchase order system so that they could receive invoices from suppliers. This had the additional advantage that some of Hanson's suppliers had already implemented electronic trading systems with builder's merchants, etc.

The approach

The approach adopted by Hanson had been based on a belief in the benefits of electronic exchange.

Initial attempts to get EDI going had failed for reasons unconnected with the technology but more to do with commercial and operational concerns. The emergence of a collaborative industry-wide approach clearly made a big difference, but Hanson had not made this a prerequisite. However, Hanson has actively supported the idea of common exchange standards as offering the best chance for widespread adoption of electronic information exchange.

The initial contact had been made between Hanson Aggregates and a number of contractors. This offered clear commercial and operational benefits to Hanson and had been their first priority. It was regrettable that the contractors were not as fast to get up and running as the suppliers, but they too are now increasingly 'going live'.

Having implemented the first invoice link with a supplier, Hanson targeted similar organisations, and within just a few months, Rugby and Castle Cement joined Blue Circle in sending CITE invoices to Hanson. In effect, once you have an electronic trading link, you only need to know the number of other companies so enabled to start trading with them in the same way. However painful the first implementation may turn out to be, it is plain sailing thereafter.

The benefits

The obvious benefits of electronic information exchange are generally well known, including the ability to:

- avoid re-keying or scanning data;
- avoid transcription errors;
- access data more quickly;
- store and retrieve information electronically;
- gain more time for planning and problem solving.

In Hanson's case, these were all apparent. They also focused particularly on the number of tasks involved in the handling of paper invoices and registering them into their accounts system.

Invoice receipt and manual processing analysis

*Time saved: more than four man-days per month (and with less than 10% of invoices by EDI);
EDI cost saving per invoice: more than 40 pence.*

Nine tasks were identified, timed and costed, from collecting and opening the envelopes, to attaching accounts slips and preparing to match data. At that time, about 600 invoices were being received electronically each month; this was less than 10% of the total invoice processing. Time saved from processing invoices amounted to just over four man-days each month, representing a cost saving of over 40 pence per invoice.

The intangible benefits are expected to outweigh the tangible ones, but are often discounted as being either 'woolly' or 'overstated'. Their inclusion here could be seen by some to be 'leading the witness' simply because they have not been, or cannot be, analysed as for the previous tangible savings. However, Hanson and the others that have adopted electronic exchange have largely become involved because of such benefits.

- Improved partnering, currently in vogue, can be built around the effectiveness and mutual trust that comes from electronic exchange. Sending invoices in an envelope is one thing, knowing that they are received and rapidly processed without errors, is another.
- Reducing the number of transcription-based mistakes must be worth something but, unless the cost of handling current problems is known, how can we value their avoidance?
- Savings from re-keying data leave more time to handle queries and problems that arise.
- Process automation and streamlining. Data matching can be faster, allowing most transactions to be processed automatically; only those failing to meet specified criteria are presented for manual intervention.

Management issues

As time has gone on and experience gained, implementing electronic exchange has become largely routine. The excitement of being at the forefront has diminished, but the confidence in a speedy and successful outcome is probably a fair compensation.

For Hanson, there was no doubt that allocating one of their system developers to work full-time on the project was crucial. Harbinger were also required for development in other areas, such as the multi-divisional processing which involved them in testing.

Hanson also benefited from the design of their existing computer systems. The sales invoice processing system could generate a file of invoice information which could be fairly easily reformatted into the CITE flat file layout. Pre-existing programs used on the purchase side (which processed invoices passed between regions) were adapted to load the CITE files. Hanson were already familiar with transferring files between their mainframe and PCs, and all these factors enabled them to immediately integrate electronic exchange with existing systems, and pass on that benefit directly to customers, suppliers and the regional offices.

Having seen it in operation, Hanson's purchase ledger departments have adopted the concept of EDI enthusiastically, and are now engaged with other suppliers in setting-up similar trading partnerships.

The cost of setting-up an invoice exchange capability varies from company to company, but the Hanson experience contains many typical elements. Once established, an electronic exchange system can be used for many more trading partners and document types, with little or no extra set-up costs. Running costs related to the software should remain the same, but transmission costs will increase proportionally.

Cost example

All costs have been based on charges in May 1999 applicable to a member of CITE, and are subject to VAT at the prevailing rate.

EDI System:

● Harbinger EDI software (CITE Version)	£995
● Annual support	£405
● Harbinger Network (annual)	from £240
● TSI Mercator Mapping s/w	£200
● Annual support	£60
● Post & packaging	£15
● CITE data converters ('maps') free to CITE members	
● Installation support (one day)	£400
● CITE invoice processing software (view, print, archive)	£250
● Total	£1,860 plus (from) £705 pa

Hardware and internal costs:

● PC (if none available)	£750
● Modem	£50
● System integration	see below

The final link - creating a flat file output or loading data from a flat file - depends on the particular software being used. Increasingly, CITE interfaces are being sought as standard product features, but this is not yet a universal opportunity. Hanson estimated the internal software integration costs ran to £8000.

Current/future strategy

The next logical expansion was to transfer the functionality developed by Hanson Aggregates 'central' directly to Hanson Aggregates South. Before starting work, Hanson Aggregates South had undertaken a detailed analysis of the tangible benefits, which clearly apply to their Central region as well.

Once this is successfully completed, There are two key targets for the next stage of the process:

- implementing electronic trading with contractors
- introducing new electronic documents, such as orders, despatch advice notes, etc.

In both cases, progress has already been made and their only intention is to increase the impact of electronic exchange.

According to David Oatley, the key lesson learned was 'persistence'.

Other IT Case Studies

- 1 Electronic exchange of project information:
3COM Project, phase 2
- 2 Property portfolio management using a CAD-linked database:
Stoke Mandeville Hospital
- 3 Electronic information systems:
Fitzroy Robinson
- 4 Modelling of building services:
33 Old Broad Street
- 5 Information systems within a design practice:
Levitt Bernstein Associates
- 6 CAD and electronic communication in surveying:
Weatherall, Green & Smith, Leeds
- 7 Transforming traditional processes in a small surveying practice:
Robinson Low Francis
- 8 Electronic tendering using the CITE standard
- 9 Converting from traditional draughting to 3D CAD:
MacKellar Schwerdt
- 10 Sales and marketing support:
John Sisk & Son Ltd
- 11 Electronic issue management:
GreenPark, Reading
- 12 Extending use of an image management system to SME trade contractors:
Bluewater retail park
- 13 Leveraging IT use in a professional practice:
Atlier Ten
- 14 Specifying construction products on the web: how construction product manufacturers and materials producers can use the world wide web to market to specifiers
- 15 Exchanging 3D models with steelwork fabricators:
Whitby Bird and Partners

This is one of a series of case studies on the application of IT to construction produced by the Building Centre Trust. Each case study is written by an impartial author and monitored by an independent steering group drawn from various sectors of the construction industry.

The authors of this report are employed by the Building Centre Trust. The work reported here was carried out under a contract jointly funded by BRE and CRC Ltd and the Secretary of State for the Department of the Environment, Transport and the Regions.

Any views expressed are not necessarily those of the Secretary of State for the Department of the Environment, Transport and the Regions.

The Information Technology Construction Best Practice (ITCBP) programme is an initiative under the Construction Best Practice Programme. Contact ITCBP at:
Princes House
39 Kingsway
London WC2B 6TP
Fax: 0207 379 3030
email: itcbp@davislangdon-uk.com
web: www.itcbp.org.uk

Authors:

Tim Cole: *Interlock*

David Oatley: *Hanson Aggregates Central*

