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UN-EDIFACT OR XML: A CRITICAL ECOMMERCE DECISION

Questions are being raised about whether UN-EDIFACT or XML messaging should be adopted for eCommerce. The case study method is used to describe and directly compare experience implementing messaging in two industry projects of a similar size, scope and complexity: one involving the design and piloting of UN-EDIFACT messages in the international Maritime Transport industry over a one year period 1994-95; the second involving the development, testing and implementation of XML messages in the Superannuation Industry over a four year period 1998-2002. The comparison highlights the importance and impacts of message selection and describes the issues encountered and outcomes. The paper concludes by listing criteria for use when determining the appropriate messaging protocol for eCommerce initiatives.

Introduction

Australian research undertaken for the National Office for the Information Economy (NOIE)[1] into the outcomes of eCommerce projects finds failures are normally due to:

- Inappropriate project management
- Technology: protocols, security, tools, eGateways
- Message Standards: uncertainty, concern
- Cost
- Lack of appropriate skills & experience

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[1] Refer to the various reports on the website of NOIE: www.noie.gov.au

- Slow take-up (fear of failure, poor business case)
- Failure to complete (due participant drop out, delays).

This reinforces the importance for all eCommerce initiatives of correctly determining factors related to and impacting on:

1. Project management (people & organisations)
2. Message development, including protocol[2] and syntax[3] selection (skills, technology and interoperability)
3. Implementation (eGateways, Straight Through Processing)
4. Take-up rates of trading partners (cost/benefit, ROI).

The choice of messaging is crucial for all eCommerce projects. A debate about whether UN-EDIFACT or XML messaging should be adopted is underway. This paper provides input to this debate by comparing and contrasting the development and implementation of UN-EDIFACT and XML messaging for industry use from a collaborative[4] project manager's perspective. It does not address issues related to "technical superiority" but concentrates on business outcomes and consequences for the project, participants and the trading community. The comparison highlights differences in effort required for each phase, the issues encountered and outcomes. The paper concentrates on the impacts of messaging on project management, message development, implementation and take-up rates and concludes by listing criteria for use when determining the appropriate messaging protocol.

Case Studies

An abbreviated case study method is used to describe and directly compare the processes used in two industry projects of a similar size, scope and complexity established to develop, test and implement Message Implementation

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[2] "Protocol" is used as a generic term the set of rules related to UN-EDIFACT or XML messaging. The author considers that XML is currently a "language" that cannot yet be considered as a "standard".

[3] "Syntax" is the form of the protocol (eg. XSD, XDR, DTD are examples of XML syntax).

[4] A "collaborative" project is a project spanning a group of independent organisations that have made a commitment (whether formally or informally) to work together to achieve mutually agreed outcomes; in which participants anticipate varying degrees of longevity in the associations from one-off, via occasional, to consistent and long-term; and in which a moderate degree of rationalisation or re-engineering is intrinsic. (Cameron & Clarke 1996, p144).

Guidelines[5] (MIGs). The author, as project manager, used the same management framework and principles for both these Australian projects. The projects involved:

- UN-EDIFACT guidelines in the international Maritime Transport industry over a one year period 1994-95
- XML Standards in the Superannuation Industry over a four year period 1998-2002.

Industry and Participant Profile

Both the Maritime Transport (Transport) and Superannuation (Super) Industry sectors were using paper documentation and cheques at the time the projects were established. Both industries have significant impact on the Australian community and although government has a regulatory role, neither industry is dominated by one organisation able to enforce messaging standards.

Transport Project

The transport industry in 1994 included over 1,000 exporters, 40 shipping lines/agents, 3 container terminal operators, 150 sea freight forwarders, over 200 road transport operators, 6 rail operators and over 30 depots and packers. The cost of preparing and delivering each document in 1994 was estimated at $40[6]. At least 9 types of document were required for each shipment. Documentation is transferred internationally. The retail industry that uses UN-EDIFACT is the key interface.

An initial review of the IT capability of project participant found that of the 11 organisations that used packages, 5 used a product with EDI capability. One participant had used UN-EDIFACT for 5 years. Three VANS provided message exchange, translation and network services. Peer to peer EDI data exchange among 3 trading partners using ISDN was occurring. One participant used email to transfer data. The implementation of EDI technology was understood within the industry and the use of UN-EDIFACT was supported internationally.

The project was 1 of 3 projects that formed part of a wider implementation of EDI sponsored by Tradegate Australia, established to facilitate eCommerce in the trade and transport industry. The scope of the project involved the

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[5] "Message Implementation Guidelines" are defined as specifications of messages, business rules, protocols and usage for use within a specified trading community.

[6] All currency is expressed in Australian dollars.

development of 7 messages. From 1 year from December 1994 to 1995 a technical and a project manager (supported by UN-EDIFACT specialists) worked with the 75 Australian participants of the User Groups and 2 key users from New Zealand.

Super Project

The trading chain includes employers, payroll providers, SFAs, regulators (eg Australian Taxation Office (ATO)), banks, and hubs. Super is compulsory for earners in Australia. There are 213 funds, 21.7 million fund members (an average of 2.7 accounts for each employee) and 530,000 employers pay contributions. In June 2000 super funds totalled $477 billion with annual contributions of $46 billion. Administration costs were over $2.5 billion a year. Superannuation documentation is confined to Australia. Key interfaces are the finance and banking industries, users of largely proprietary standards.

Between 1991-98 the Super Industry had developed 3 versions of UN-EDIFACT standards for member contributions and maintenance with the assistance of an EDI association. Each standard was developed by Superannuation Fund Administrators (SFAs) and a payroll, trialled and used for varying periods of time by 2–5 organisations before its use was discontinued due to the complexity of translation tools, difficulties in integrating the messaging with existing systems or lack of trading partners. Four project participants had used the UN-EDIFACT messages before reverting to flat file for peer to peer data exchange. Hubs and payroll providers were providing aggregation services. Three organisations used web technology for data capture. All participants used email for business purposes but not for exchange of data. No member of the industry was exchanging XML messaging.

The scope of the project, sponsored jointly by three industry bodies and the ATO and NOIE, involved the development of 5 transactional messages, workflow and payments conventions. From 1998 to 2001 50 volunteer organisations, formed into Special Interest Groups (SIGs) comprising about 20 business users, developed technology neutral messages. Independently two separate groups, comprising 25 participating organisations, contributed resources to testing messages and developing MIGs from 1999 to 2001. The protocol and syntax was determined by these participants. The project was staffed by a part-time Project Director and a full-time Project Manager.

Collaborative Project Management

From the perspective of a Programme Manager, the management and implementation of eCommerce is complex. Traditional project management methods are inadequate if:

- Participant organisations are volunteers
- No single formal power or unified authority exists
- All participants and their representative(s) must benefit
- Group cohesion must be maintained throughout the project
- All participants must agree with decisions
- Decisions, schedules and specifications cannot be imposed.

eCommerce requires the use of a "collaborative project management" framework and process combined with the availability of appropriate technical knowledge. In 1995 the author worked with Dr Roger Clarke to develop a framework for collaborative project management. This framework is set out in "Towards a Theoretical Framework for Collaborative Electronic Commerce Projects Involving Small and Medium-Sized Enterprises" (Cameron & Clarke 1996). Based on this research and subsequent experience both projects were managed successfully according to the framework and principles set out in this published paper. Additional details about project establishment, governance, activities and outcomes for the Transport project are set out in the EXTEDI Project Report (Cameron J & Jeacle P 1995) and on www.tradegate.org.au; and for information about the Super Project refer to www.superec.org.

The main impact of message selection for project management relates to:

- Time taken to complete the project (Longer elapsed timeframes significantly increase the risk of participant drop out, burnout and loss of motivation of management and representatives as well as increasing project cost)
- Complexity of development, testing and implementation
- Need for technical skills transfer if the protocol new within the industry.

Message Development

The methods used to for MIG development varied in the phases used and the process adopted. A formal documented process described in The "SIWG Message Development Process Method 1.1" (Finkelde et al 1999), incorporating the use of data modelling tools, was used to develop the Super message to ensure rigour and consistency. This was important because messages were reverse engineered from UN-EDIFACT or were developed for additional super

transactions. Specifications were technology neutral and appropriate for UN-EDIFACT, XML or flat file. The average elapsed time taken to develop one draft message was 5 months.

The use of UN-EDIFACT was determined by the industry prior to the establishment of the Transport project. Business analysis was used to identify the data required for the business transactions and for verifying mapping to UN-EDIFACT Standards. The elapsed time taken to develop seven draft MIGs was 6 months.

The following table describes and compares message development for each project.

Transport - UN-EDIFACT	**Super - XML**
Phase 1 – Data Analysis	**Phase 1 - Industry Modelling**
Data content of documents used by various trading partners was identified. The purpose of data as used by sender and receiver was examined to eliminate redundant or non-essential items. Ambiguities in data and/or its meaning were resolved. Codes were assessed.	Models showing major information flows for each transaction were developed. The information flows were identified by users and modelled by data analysts.
Phase 2 –Data Flow Analysis	**Phase 2 - Assignment of Responsibilities**
Data origin and flow through the trading chain was documented for different scenarios to ensure data was entered at source. Modelling led to the change of project scope to include booking messages, formerly excluded.	The responsibilities of key roles and activities associated with each transaction were assigned by Users and mapped by data analysts.
Phase 3 – Data Specification	**Phase 3 - Business Transaction Sequence**
Information was broken down into individual items for transfer to the data elements of UN-EDIFACT messages.	Priority for message development was established and agreed by the Working Group and Council.
Phase 4 –Industry Process Review	**Phase 4 - Generic Transaction Development.**
Existing industry practice was analysed to identify and eliminate unnecessary document exchange (eg use of waybills rather than Bills of Lading that require a signature for legal purposes). Opportunities were taken to streamline processes. Sophisticated IT and EDI users raised User awareness of how technology can reduce cost and increase processing speed within organisations.	All data required to process a transaction was identified. This was assisted by existing legal regulations that specified data for reporting. There was greater variation in the data required by SFAs for business transactions, like contribution payments by employers.

Phase 5 – Flow & Function Specification

Message flows and business function throughout the trading chain was confirmed. Booking messages were designed for multi-use (eg by exporters to book ships, road and rail carriers and by packers to book containers.) Data, context and scenarios for each activity were specified and processing rules agreed.

Phase 6 – MIG Development

EDI experts selected the D94B version of UN-EDIFACT as capable of providing the data and functionality identified by User Groups. Data items identified in analysis and specification phases were cross referenced to data elements in the Standard by project managers and confirmed by EDI experts who then generated draft MIGs.

The size, complexity and structure meant implications of data placement within message segments required lengthy discussion at User Groups. The use of 3 letter tags for segments (eg NAD for name and address; codes to indicate purpose) and separators makes sample messages difficult to read by users. Where structure, data and code sets were inadequate, requests for change were referred to Australia representatives on the UN-EDIFACT Joint Transport Group (JRT) for inclusion in a revised internationally "harmonised" Standard.

Drafts were discussed by a combined group of Users and developers to resolve technical issues and queries.

Phase 5 - Business Scenario Identification

All variations in scenarios and business lines to be supported were identified and the data recorded. Each user consulted experts in their organisation to confirm data models included all data required for each scenario. The number of scenarios was rationalised where possible to reduce complexity.

Phase 6 - Technology Specific MIG Development

UML Models and data modelling tools were used by data analysts to prepare draft messages for testing. A Data Dictionary was developed for all messages and loaded into a modelling tool. Where possible all specifications were harmonised with ATO specifications for super reporting and regulatory purposes[7] which meant some application systems already complied with the specified field types, formats and lengths. Drafts were reviewed and revised by SIGs before referral to the Working Group for final QA and approval for testing.

XML protocol XSD syntax version 1999 was selected by project Steering Committees (and confirmed at the conclusion of each stage of testing) because it:

- Allowed some validation of message
- Readability by users and ease of QA
- Business flexibility in the internet world
- Simplicity of testing.
- Mutual learning.

Security issues (eg authentication) were challenging. PKI was too expensive. PGP was understood and available.

[7] In 2002 ATO Reports are transmitted via flat file through a proprietary gateway or sent on diskette.

Testing draft Message Implementation Guidelines

Transport Project

Pilots began when the draft messages were complete in May 1995. The test objectives were to ensure:

- MIGs were suitable for business needs.
- Standardisation and completeness of code lists
- Interconnectivity of communication networks provided by the VANs
- Software compliance with MIGs and other relevant standards
- Interoperability of software.

Prototype software was used for test the MIGs and also to assess issues related to automated processing. MIGs and translation tables for the 94B Standard were delivered to vendors of packaged software and in-house developers in May 1995. In June and July 1995, the project managers worked with providers of in-house software and of packaged solutions to develop or change software to comply with the MIGs. VANs updated translation and mapping facilities to enable exchange in D94B format using Syntax A[8].

Pilots took place from 7 July to 20 October, 1995 using 3 software packages and 2 in-house systems. Sample data allowed software to be tested prior to installation within User sites. Messages were exchanged (peer to peer and hub and spoke) among 10 trading partners involved in a variety of export products. VANs provided mail boxes and transmission of messages free of charge to participants during the pilot period. Initially messages were exchanged among trading partners using the same software to ensure the guidelines were satisfactory for business use. Messages were then exchanged:

- among trading partners using different software to ensure compatibility
- trading partners transporting different commodities via different transport modes
- through a variety of trading chains.

Users and software developers reported changes required to the messages to the User Groups.

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[8] Syntax A is based on the telex standard and requires the use of upper case and uses " ' ", "+" and ":" as delimiters. Syntax B was developed more recently and uses characters not available in the older standard.

The MIGs were agreed by the User Groups and the industry for use in Australia and New Zealand, published and "frozen" for 3 years until 1998. Tradegate Australia maintains and updates the MIGs in accordance with local needs and changes in international Standards.

Super Project

A separate project Steering Committee was set up comprising participants interested in assessing the messages required to complete one transaction type. Test objectives were to:

- Test the fitness for production of each Standard
- Ensure cross dependencies are complete
- Ensure business rules are complete
- Test the fitness for production of each protocol (XML, XSD; email; WinZip for compression; PGP for security)
- Prepare technology specific guidelines.

Between 8 and 14 trading partners were involved in peer to peer exchanges for each of the 2 projects. Testing took an average of 6 months over an elapsed time of 12 months. XML messages were generally prepared and processed manually although one payroll provider did upload and download data to their application from existing test databases and one SFA used a translation product. Spreadsheets, templates schemas and a parser were used to prepare and process XML test messages. Conformance suites were generally used XML message testing was hindered by lack of tools and changes in XSD syntax versions. Learning and skills transfer related XML took time. The following 5 stage testing process used was designed to overcome these limitations:

- Pretest assessment of data and specifications
- Exchange of main XML message only
- Initial exchange of all messages required to complete transaction
- Exchange of all messages using business rules and all protocols except security
- Final exchange of all messages using all protocols and draft guidelines.

Change requests agreed by the Steering Committee, were referred to SIGs at the end of each phase. Revised MIGs were used in the next test round.

The lack of a single body accountable for XML means changes to syntax are difficult to achieve even if participants are active on international bodies. A request to W3C to allow the use of "&" in messages was unsuccessful.

Ampersand remains a reserved character in XML because of the notion of entities and entity references in XML.

MIGs were frozen for 2 years and made available to participants progressively for use by the Superannuation Industry in Australia. A permanent body is to be established by the Super Industry to manage the trading community and maintain and update MIGs.

Message Implementation

A rollout of the transport MIGs was undertaken by Tradegate Australia. Initial implementation was facilitated by the existence of compliant EDI enabled software and in-house systems used in the pilot project. Two participants immediately adopted the MIGs for live peer to peer exchange of 5 messages in the trans-Tasman trade. VANs and software vendors assisted take-up. Within 12 months 2 of the 7 commonly used packages were compliant. When trading partners agreed dates for commencing e-transactions, compliance and interoperability was assessed during testing with the new partner prior to live exchange. The use of UN-EDIFACT facilitated international and cross industry exchange (eg with retailers) of electronic messaging.

Although Tradegate Australia had experience with EDI implementations, and was able to provide technical assistance, education and marketing, the cost of systems integration, EDI technology and VANs hindered take-up by smaller organisations in the trading chain until industry wide use of IT and internet was increased. When a web-based e-Forms solution was implemented usage by small organisations increased significantly.

In the Super Industry the lack of appropriate XML XSD tools and expertise resulted in slower than expected initial take-up. The first live transaction of 1 message between 2 trading partners took place 11 months after the MIG was published. Delays resulted from the complexity of establishing e-gateways, integration with existing application and processing systems and Straight Through Processing. Cost of implementing new technology is always high making cost/benefit less viable for early adopters.

Partners were tested independently for compliance of their e-gateway systems and messaging with the MIGs and "certified" to exchange message types. By March 2002 2 out of 20 vendors of software and tools were considered compliant, but a further 6 vendors will be compliance within 6 months. XML does have the advantage of facilitating web-based solutions, data mapping and the integration and aggregation of data from different sources simplifying peer to peer exchange. Interoperability with banking was achieved

and compatible XML message development is underway within the investment industry.

Conclusions

In addition to the issues encountered at each phase in the case studies and the outcomes described, key factors related to the choice of messaging relate to the:

- **Business requirements** and priorities of the different business types within the industry and trading community. For Transport, international and inter-industry exchange was essential and UN-EDIFACT was the established Standard. For Super, the ability to integrate with web interfaces was very important.
- **Time for completion of message development and implementation.** A messaging protocol can increase the complexity of projects and significantly expand the time required to complete the project and therefore the risk of failure.
- **Interoperability among trading partners**. Certification of e-gateways of trading partners, software and other products is required prior to admittance to the e-Trading Community. Transport EDI users in 1995 reported continuing difficulties in sending messages to partners using different software packages and/or connected to a different VAN due to the use of proprietary interfaces. This discouraged take-up. All protocols must be interoperable and reliable. All trading partners must adhere to established business rules and industry procedures.
- **Take-up rates and achievement of critical mass.** Take-up is a factor of cost benefit, availability of solutions, simplicity, risk, confidence in the technology and messaging, and peer and community pressure. Benefits are realised when most transactions with key trading partners comply with industry ecommerce standards. New protocols mean new technology and added cost. Business cases are less viable and cost/benefit is less favourable for early adopters. Technical skills may not be available in house and be in short supply in the market.
- **Maturity and stability of messaging protocol**. The frequency of revision and ease of amending MIGs are important factors affecting systems maintenance costs. The Australian representatives on the UN/EDIFACT JRT were able to expedite changes to the Standards to ensure they met the needs of the Transport project. There is no single body responsible for XML

and there are numerous types of XML (eg XDR, XSD, DTD). The selection of an immature, unstable messaging protocol and syntax before tools and organisational expertise are available does carry a higher risk for project management and implementation. The Super project confronted tools that were not backwardly compatible, products where APIs were not available and complex technical integration issues that took additional time to resolve. In 2002 the selection of XML is considered a higher risk than UN-EDIFACT.

- **Universality.** In global commerce most industries require messaging that is internationally "harmonised" and can be used for e-transactions with trading partners in other countries. If messages are to be exchanged internationally, and the sender and receiver speak different languages, the tags should be "language neutral". This issue is illustrated below.

UN-EDIFACT: Employer name and address

NAD+BG+EMPLOYERID++ACME MANUFACTURING+1234MAIN STREET+ FAIRFIELD+VIC+ 3210'

XML XSD: Employer name and address

```
<EmployerDetails>
    <EmployerID>ACME MANUFACTURING</ EmployerID>
    <AddressLine1>1234 MAIN STREET </AddressLine1>
    <AddressLine2> </AddressLine2>
    <Suburb>FAIRFIELD</Suburb>
    <State>VIC</State>
    <Postcode>3210</Postcode>
</EmployerDetails>
```

On the basis of experience illustrated in the two case studies, in addition to considering the key factors related to the choice of messaging, the following criteria should be applied when determining the appropriate messaging protocol for eCommerce initiative:

- Message standards are mature
- Tools are available and mature

- Skills and expertise related to the messaging protocol and the associated technology are available within participant and vendor organisations
- Project elapsed time remains short (less than 18 months)
- Integration with existing with technical and business systems is understood
- Successful examples are established in similar industries
- Key partners and vendors will commit to implementation if the messaging protocol is selected
- Interoperability among trading partners within the industry and with inter-connected industries can be achieved within a realistic timeframe and at an accepted cost.

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