APEC e-Business: What Do Users Need?

Prepared for

The APEC Telecommunications and
Information Working Group

by

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1 Preface

In discussion of requirements for implementation of e-commerce, the particulars of information technology and communications networks are sometimes presented as if they are separate issues. In reality they must be considered together, especially in developing economies where risk capital is in short supply and the realities of technology, networks, and support services must be evaluated in order to make wise and sustainable investments.

"APEC e-business: what do users need?" reports on a study of user requirements for the integration of e-commerce systems in the APEC region. It was presented by Australia at the 24th meeting of the Telecommunications and Information Working Group (APEC TEL 24) where it was considered by the Business Facilitation and Human Resources Development Steering Groups.

The report provides an overview of issues relating to e-commerce integration and a "snapshot" of a number of standards and technology issues that should be considered where integrated systems are being developed in government and business environments. The report assists integrated consideration of these issues by providing a framework that should be useful to a variety of users in the APEC region including:

- SME organisations and community self-help networks,
- developers of electronic government systems, and
- centres for skills development.

This framework will have continuing value to APEC TEL and other APEC groups concerned with the development of electronic commerce, even as technologies and standards continue to evolve at a rapid rate.

The report points out that particular technologies and standards may change rapidly. In that context, investors must be prepared to seek expert advice. The 'snapshot' of particular technologies and standards in the report is not intended as a long-term guide to changing technologies. On the other hand, the framework presented in the report will assist users over the long term to ask questions that are relevant to their particular circumstances and efforts in developing electronic commerce systems.

Beyond technology issues, the report looks at business models, and at legal, cultural and linguistic issues that have to be resolved for businesses to work effectively across borders, and to establish necessary levels of interoperability with clients, government agencies and business partners.

After considering this report, APEC TEL agreed to convey the report to other interested APEC groups: such as the E-Commerce Steering Group, the Working Group on Electronic Financial Transactions, the Transportation Working Group, Sub-committee on Customs Procedures, and others.

The TEL Working Group Meeting recommended that governments should consider the cost-benefit effect on smaller businesses that arise from e-business adoption strategies. For example, small businesses should not be obliged to adopt technologies that are costly, incompatible with their current infrastructure, or overloaded with capabilities beyond their actual needs. Governments should encourage consultation with well-informed business users, as well as with technology providers, in the assessment of priorities for developing electronic business and government systems.

APEC TEL will continue to support work focussed on cross-border interoperability for B2B activity in the region.

APEC TEL will also consider other ways to promote information sharing on interoperability issues. We welcome technology suppliers and business users to be engaged in ongoing business facilitation work in APEC TEL with support, where possible, from independent experts.

In the area of related human resource development, APEC TEL will encourage development and delivery of training based on the report's framework for assessing

e-commerce initiatives in terms of

- business collaboration,
- business needs, and
- technology solutions.

This report was produced as a project of APEC TEL. It was funded by Australia's Department of Communications, Information Technology and the Arts through the National Office for the Information Economy, and was prepared by the Commonwealth Scientific & Industrial Research Organisation in consultation with an oversight group within the APEC TEL Business Facilitation Steering Group.

Richard Thwaites
Chair
APEC Telecommunications and Information Working Group

2 Executive Summary

Business-to-business (B2B) e-commerce has already changed forever the way enterprises conduct business. Although some elements of the Internet economy have slowed, forecasts still show that effective deployment of e-commerce solutions in supply chain management will have immense economic impact across the world. Rather than creating new businesses, the major value is to come from streamlining existing procurement processes and improving general B2B communications, resulting in substantial cost reductions.

Despite the plummeting costs of network infrastructure offered by the Internet, implementing a B2B strategy still represents a considerable and costly challenge for most companies. Larger organizations can at least be comforted by the fact that they can amortize costs: they also may be able to call the tune to which smaller supply-chain partners must dance. These SMEs typically are not cash-rich and do not have skilled IT staff or the necessary IT infrastructure. For them, new XML-based Web service integration technologies may hold some promise for reducing costs other than basic networking: the cost of tools and off-the-shelf solutions will fall; as the capabilities and flexibility of the technology increase, as XML-based business standards stabilise, some integration tasks will be achievable more quickly, by less skilled and less costly personnel. For the foreseeable future however, skilled integration technologists and other IT professionals will be needed for all but the simplest scenarios.

For many parts of the community in the APEC region, poor or non-existent network infrastructure means that they are still denied the basic advantages offered by the Internet economy. The possibility of relatively low-cost rollout of novel networking technologies is enticingly close, but commercial realities may still see vast ‘unprofitable’ regions unserviced.

For many SMEs in APEC economies who do have network access, the problems of cost of skilled personnel and of integration technology, possibly set at close to European or U.S. rates, can be stifling. Even then there are other challenges, not necessarily about technology or cost, that further hinder their participation in global e-commerce supply chains:

- The need to comply with formalised business processes and rules for automation in software as dictated by dominant supply-chain partners
- Implementing security practices that must comply with supply-chain requirements. This involves developing security practices, selecting appropriate technological solutions from the many alternatives on the market, such as communications links
- Complying with national and international law and regulations regarding e-commerce that are often confusing and even contradictory

- Cultural and language differences that may give rise to communication errors when dealing with important business decisions.

For these smaller organizations across the region, B2B strategies must ultimately see the above issues addressed. All stakeholders can contribute to their success:

- The SMEs themselves, and self-help on-line trading communities they might form
- Multinationals and similar larger supply-chain partners who can help find appropriate business and technology solutions within the means of all parties
- Governments, who can lead the way by moving their business on-line and set examples of successful integration between large and small organizations.

This report attempts to characterise some of the business and technical challenges that companies face in moving to this new on-line world. Where appropriate, the issues concerning SMEs and international e-commerce are addressed specifically. It also summarises the range of technologies that are available, including payment, security, messaging and 'off-the-shelf' packaged solutions.

The report concludes with an analysis of the major issues and challenges for adoption of international B2B e-commerce for SMEs. Finally, recommendations for actions to mitigate some of these issues are suggested. The key findings are:

Needs and Readiness

- Business models: key drivers are efficiencies to be obtained in supply-chain costs and timeliness. Costs may be harder to predict and control in cross-border trading due to e.g. fluctuations in the exchange rate; complications due to jurisdictional and regulatory issues; trading in unfamiliar cultures and languages; reduced confidence in security infrastructures across national boundaries.
- Adopting B2B e-commerce may require changes to established business processes and organisational structures. These changes bring further costs and disruption to the organisation and have to be justified by improved efficiency or commercial necessity.

Technology

- Existing integration technology can be used to build B2B e-commerce systems. New technologies such as B2B collaboration technologies, Web services and possibly ebXML technologies will offer cheaper and simpler integration mechanisms. If anything, there is seen to be too much technology and too many choices. Market competition will see costs of technology fall and capabilities increase.
- The ease with which this new technology integrates with common business desktop applications remains to be seen. Such issues will be critical for small businesses.
- The necessary industry-wide standards for exchanging B2B documents are under constant revision, with reasonable stability being achieved in some areas.

- Despite the downturn of the Internet economy, there is still a shortage of IT professionals with the necessary knowledge and experience in building B2B systems, especially in the Asian economies where the Internet infrastructure and applications are developing rapidly.

Legal and Public Key Infrastructure

- There is uncertainty and a lack of understanding about the status of legal frameworks that protect the interests of e-traders, target unlawful activities and regulate trade practices for on-line business. These concerns are amplified for SMEs considering trading internationally, where it is unclear what legal recourse e-traders will have in the case of disputes.
- Despite projects to demonstrate PKI interoperability across borders, PKI regulations and e-commerce laws differ between legal jurisdictions. This can create difficulties for multi-national companies and SMEs alike when dealing with foreign customers and partners.
- Multilateral agreement on the content of digital certificates is unlikely as different organisations have different needs and purposes for their certificates.

Government Initiatives

There are a large number of e-commerce initiatives already under way in the region sponsored by local governments. These can be complemented in areas of special need such as:

- Assistance with establishing adequate network infrastructure
- Organisational and business infrastructure schemes such as establishing e-commerce intermediaries for particular communities of interest
- Outreach, extension, self-help schemes dealing with business planning and modelling, security practices and infrastructure, and legal frameworks
- Low-cost integration technology initiatives exploring the use of new B2B integration frameworks and business standards
- Government can lead the way in demonstrating effective adoption of new technologies for supply-chain integration. Experience of government interactions with small business would be particularly valuable. It would help to build a critical mass of knowledge and experience with emerging e-commerce practices. Much of this knowledge would benefit many organizations within the APEC economies.

3 Introduction

It can be a confusing time for companies engaging in business-to-business (B2B) e-commerce for the first time. They have witnessed a slump in confidence in the internet economy; they have also seen e-marketplaces shut down only months after trading has commenced. For those involved, the enticing potential of new electronic markets brought with it considerable risk. On the other hand, the Electronic Data Interchange (EDI) initiative, now almost 30 years old, has shown that there can be considerable gains to be made by conducting bread-and-butter business electronically, albeit at some cost, and with some stakeholders gaining more than others.

With the widespread adoption of Internet standards and technology, it becomes possible for more enterprises to adopt business-to-business supply-chain integration similar to EDI but potentially with much lower infrastructure costs. With recent failures in mind however, business efficiency and profitability need careful planning and management – in fact savings here are now core drivers for conducting e-business at all. As (B2B) e-commerce becomes more common, how well companies work with their suppliers, customers and other partners in the value chain will have a dramatic impact on their success and long-term viability.

For smaller organisations, the opportunities can be outweighed by the challenges. On the one hand, these electronic linkages can strengthen business relationships, improve efficiency and provide faster access to a wider range of information. They can offer opportunities to find new markets, alliances and potential business partners. On the other hand, organisations must adapt to new business requirements with unprecedented flexibility and speed. They will need to integrate existing IT systems and applications with B2B trading partners. Such fundamental changes are unavoidable. Although the Internet makes network connectivity affordable, software systems integration, in all its forms, is still likely to be a significant cost factor.

For smaller companies in less developed economies, attempts to put their business online can be further hindered in several ways. Most significantly, essential network infrastructure may not be in place at all, particularly if they are located in remote or regional areas. If their business relies on local trade, Internet or PC penetration may not have reached a sufficient critical mass to make the exercise worthwhile (see Figure 1 below).

The huge variations that exist in such fundamental issues as network access, and the enormous loss of opportunity this represents to many elements of APEC and other economies, is a matter of high importance being addressed by governments around the world.

	Telephone Density	PC Penetration *	Internet Penetration	Wireless Penetration
Australia	52.12	47.06	40.54	34.28
Brunei	24.68		1.19	20.52
Canada	65.45	36.08	42.8	22.65
Chile	20.7	6.66	4.12	15.05
China	8.58	1.22	1.34	3.42
Hong Kong, China	57.57	29.76	26	63.61
Indonesia	2.91	0.91	0.18	1.06
Japan	49.4	28.69	21.38	44.94
Korea	44.14	18.29	32.31	50.03
Malaysia	20.3	6.87	6.88	13.7
Mexico	11.22	4.42	2.49	7.94
New Zealand	49.03	32.65	35.08	23.01
Peru	6.69		0.04	0.15
Philippines	3.95	1.69	1.5	4.02
PNG	1.14		0.62	3.66
Russia	20.64	3.74	6.3	0.09
Singapore	48.2	43.66	41.91	41.88
Chinese Taipei	54.52	19.7	28.84	52.24
Thailand	8.57	2.27	1.65	3.84
USA	68.18	51.05	53.72	31.15
Vietnam	2.68		0.13	0.04

Figure 1: Indicators of technology penetration across APEC economies[1]

Conducting business across borders may be complicated by other factors. The standard ways in which the legal system supports business confidence and trust may be inapplicable (because of different laws applying to e-commerce situations), or simply too hard to follow through should the need arise (such as taking legal action to resolve disputed trades with partners in other economies).

[1] ITU and NUA data quoted in APEC TEL 23 paper by Dianne Steinour "*Policies to Reduce the Digital Divide: responses to the APEC Questionnaire"* , document v/20, available from: (http://www.apectelwg.org/apec/atwg/previous.html#wd)
* % households. Other columns % population.

Physical distance and cultural separation further exacerbate security and trust issues in cross-border trading. Small businesses, using a public network like the Internet, need to resolve their security issues as a high priority. Not only must they provide measures that adequately protect their own interests, they may also need to implement procedures that satisfy the more stringent requirements of multinational companies.

All the while there is immense activity by B2B integration technology vendors. New products, and new variations on old products, continue to further populate a marketplace that is already crowded. Vendor operations are penetrating all corners of the globe as they seek to establish market share in the phenomenon of B2B integration.

Similarly, e-commerce standards and technology initiatives are extremely vigorous. Some appear to be battling each other for supremacy but relationships are sufficiently fluid that positions can turn around overnight. Predicting the future is difficult for end-users and vendors alike. For such reasons, it is not unusual to see vendors keeping several options open.

The apparent chaos will however stabilise to some degree. For example, it seems certain that the tools and technology surrounding Web services with The Simple Object Access Protocol (SOAP) and Universal Description, Discovery and Integration (UDDI) will mature and become a permanent feature of the landscape; the Electronic Business XML (ebXML) initiative will undoubtedly make its mark also. There may be benefit flowing on to small companies from such initiatives but the extent still remains to be seen, especially in non-English speaking economies.

The themes outlined above are developed further as follows:

Section 3 outlines the basics of e-commerce supply-chain integration

Section 4 covers what is needed for successful integration

Section 5 examines the current state and future developments for global network infrastructure

Section 6 reviews current developments in standards and frameworks

Section 7 discusses the most pressing issues and challenges that hinder e-commerce integration

Section 8 suggests possible ways forward.

4 What is E-commerce Integration?

From a technical perspective, the basic principles of software systems integration are straightforward enough: two or more software programs, or systems, co-operate by one invoking the services of the other. Such integration might take place within a single organization, on a single computer, or involve several computers across a local area network. With business-to-business (B2B) e-commerce integration however, the situation changes, with the software of one business co-operating with that of another across an external network connection. This electronic exchange of messages and documents would, not long ago, have been implemented using Electronic Data Interchange (EDI) business messaging across a private value-added-network (VAN) using leased lines. Now, more commonly, businesses are integrating their software systems by passing messages across the open Internet.

From a business perspective, B2B e-commerce integration means that the application systems of two or more businesses are working together to achieve some common and overarching business goal, such as improved efficiency and reduced delivery times.

4.1 The Varieties of E-commerce

The needs of business and the available technology infrastructure greatly influence the extent and difficulty of the task of integrating business systems. Fundamental issues, such as the degree of business automation common throughout a particular industry sector and the demands of specific trading partners, will have a major impact on e-commerce strategies and how they are realised. Businesses and governments are at different stages of implementing e-commerce initiatives, also contributing to the variety and confusion. There is no single 'right' e-commerce strategy, rather there are a number of approaches and trading arrangements that are appropriate for particular businesses at particular times. These include:

- Simple point-to-point exchanges with one or more pre-established trading partners
- Opportunistic procurement through a simple connection to one or more trading exchanges
- As a member of a group of companies forming tighter trading relationships for mutual business advantage, perhaps using common document standards and messaging formats
- As a member of a sophisticated trading network where B2B relationships are formalised, documented as common business processes and automated; new business relationships are then formed dynamically as required.

For many organizations the overriding goal is to use these trading arrangements to improve supply chain integration. The fundamental issues involved are presented below.

4.2 Supply chain integration

B2B e-commerce changes the nature of business and this impacts heavily all the partners in the supply chain. It is increasingly becoming important for organisations to concentrate on the efficient flow of information, materials and finances from the suppliers to the customers and back again (see Figure 2). Designing efficient business processes throughout the supply chain, and controlling their speed, timing and interaction with one another are crucial factors in a competitive, fast changing electronic marketplace.

Increasingly, the supply chain will cross international boundaries, which brings its own set of challenges and opportunities. These are discussed further in section 7.

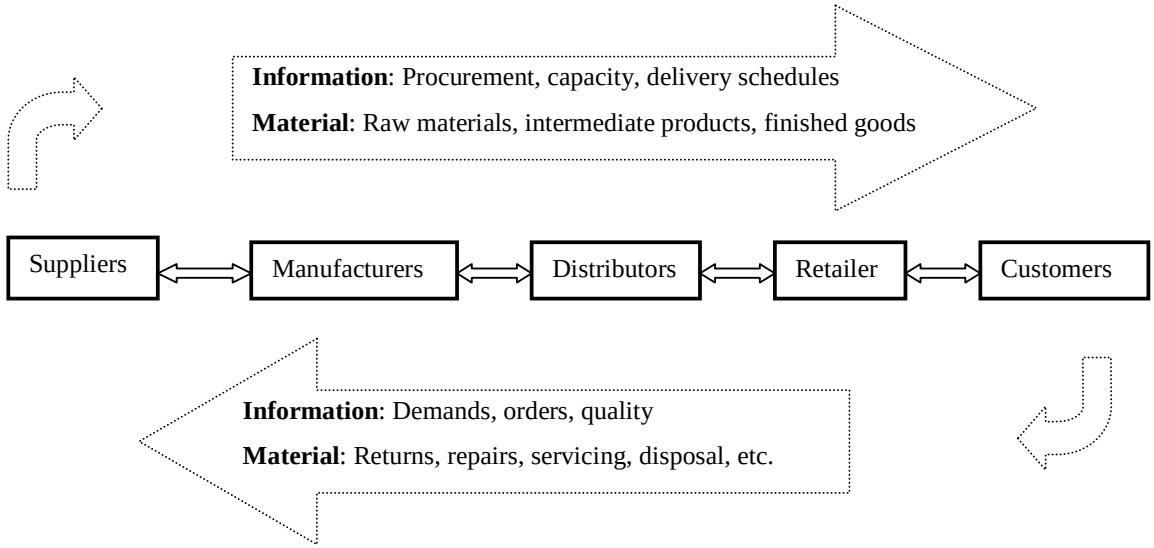

Figure 2: A typical supply chain

In general, bi-directional information, material and finance flows are the key drivers in any supply chain. As shown in Figure 3, a typical business entity in a supply chain can be simplified as a black box connected with three major types of flows. These are procurement (raw materials, goods), finished goods/services, and payment methods. One could also include logistics as a fourth link.

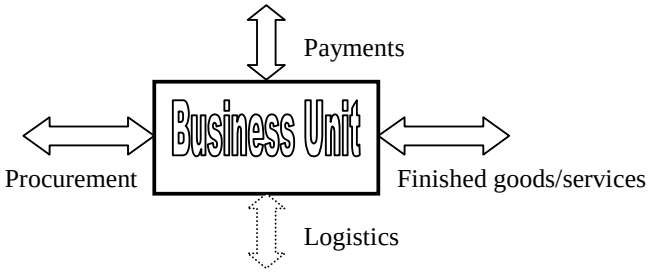

Figure 3: A typical business unit in a supply chain

In an effective B2B e-commerce environment, the supply chain can easily be viewed as a single virtual enterprise, a true value chain in which all resources use Internet technologies to communicate and collaborate effectively, providing and gaining instant access to information. An efficient supply chain can be realised by *integrating* all its business applications electronically. A complete B2B e-commerce solution can be realised by integrating IT systems at two levels. For any organisation, the first level of integration is required with the rest of the internal business, while the second level of integration is required between supply chain partners and customers. Many business customers are shifting purchasing, logistics, and overall supply management to the Internet to shorten supply chains. To this end, it is predicted that within 5 years it is likely that 20% of all business transactions will be carried out electronically.[2]

One of the biggest challenges in any supply chain is getting the right information to the right place at the right time. Traditional supply-chains have been dominated by fax and batch information transfers, mechanisms that are faltering under the new requirements for speed, flexibility and ever increasing volumes of data. The key to better supply chain performance is to ensure that all the members of the chain can create, share, and use the information that drives their collective business.

Transaction Method	Cost
Over-the counter	$2.50-$3.50
ATM	$1.00-$1.50
EFTPOS	$0.08-$0.40
Telebanking	$0.50 (approx)
Internet	$0.12 (approx)

Figure 4: Bank Transaction Costs in Australia[3]

For most organisations, years of accumulating independently developed applications running on a cross-section of hardware systems have resulted in complex and sometimes unwieldy IT environments. The diversity of applications ranges from common packaged desktop software and front-end applications, such as sales force automation, to the enterprise resource planning (ERP) software (e.g. manufacturing, distribution, HR, financial management applications) to custom-developed applications. External systems and technologies encountered through the supply chain further complicate the problem of

[2] Australian Internet & E-Commerce Special Report 11/4/00

[3] Source: Paul Budde Communications, as reported in 'Development and Implementation of Australia's Information Economy Strategy', Mike Stracey, "E-commerce Strategic Management Workshop", Bangkok, Thailand, 23/05/01

integrating all of these dissimilar systems. The key to a really efficient supply chain is *application integration*.

4.3 What is involved?

Application integration involves:

- The transportation and transformation of data between one or more business applications.
- The business rules that govern when this transportation and transformation takes place.
- The integrity constraints that determine the success or failure of the integration.

Business-to-business e-commerce integration could appear in many forms (see Figure 5), including:

- **Desktop Integration**: real time integration of data existing in user spreadsheets or other personal productivity software.
- **Integration with Electronic Data Input Devices**: real time integration with electronic devices such as bar code and optical scanners, machine tool controllers, point-of-sale systems, etc.
- **Front-Office to Back-Office Integration**: synchronising packaged and custom applications in real time.
- **Supply Chain Integration**: connecting partners, vendors and suppliers for greater efficiency.
- **Business-to-Business Integration**: extending the enterprise with secure integration to trading partners beyond the firewall.
- **Enterprise Backbone Integration**: connecting various systems across the extended enterprise.

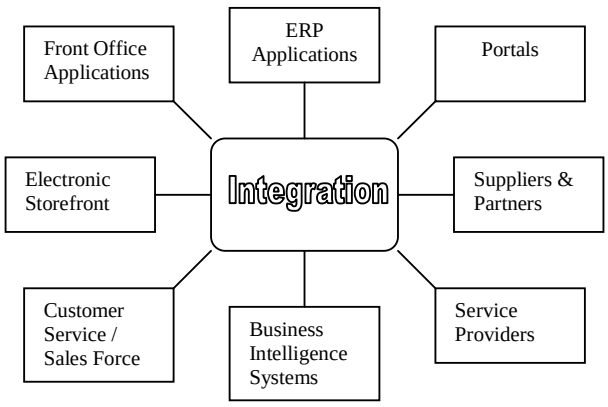

Figure 5 : Integrated business-to-business e-commerce

A complete integration solution requires the following components:

- Broad, reliable, fast and cost-effective connectivity,
- A scalable software and hardware platform,
- Common data standards,
- Reusable integration processes,
- A framework to establish security and trust.

Integration requirements are continuously evolving. For example, there is growing need for the integration of functional behaviour of the systems, not just the data alone. The flow of data must be bi-directional and must happen in real time.

4.4 How Does Technology Support Integration?

The extent and nature of technological support for integration are no less varied than the ways in which individuals, organizations, governments and whole economies conduct business with their partners, suppliers and customers: from humble e-mail systems to the more complex and expensive 'enterprise solutions'. In the latter category, the predicted growth in B2B e-commerce has attracted the attention of many integration technology vendors. They offer solutions that often feature tried-and-trusted technology but many are also introducing new, additional features that more specifically deal with B2B integration.

The technologies in this space are most generally known as *enterprise application integration* (EAI) products. Numerous factors have influenced the emergence of EAI market, including the promise of automation, the perceived value-add of e-Business integration, mergers and acquisitions, adoption of new technologies, and the need to enhance and control existing business processes. EAI targets the integration of varied types of applications that exist in and between organisations. These include core legacy systems, enterprise resource planning systems, and newer Web-based applications.

One of the leading trends is to deliver pre-built integration solutions. However, there is more to EAI applications than customisable off-the-shelf technology and products. The solution provider must have knowledge of business processes as well as a wide variety of vertical and horizontal applications and technologies. Hence, application integration is not a trivial undertaking. Many vendors are forming alliances to provide complete B2B e-commerce solutions. Some notable specialist EAI vendors are Ariba, Commerce One, and Vitria, who generally provide solutions based on existing middleware and messaging technologies from companies like IBM, Microsoft, TIBCO, BEA Systems, and NEON.

Moreover, there are new technologies that are enabling a new class of 'Web Services'. In this framework, programmatic interfaces to software within one organization can be used directly by software within another – thus enabling 'tight coupling' between software that enacts business services in both. Whilst this has been possible in the past, the new breed of Web services promise to make this type of integration simpler, cheaper and more flexible. For this reason, it has been suggested that they will help SMEs get past some cost & resource barriers that have prevented them from considering integration solutions that feature automated B2B interactions.

The technologies known as SOAP (Simple Object Access Protocol), UDDI (Universal Discovery, Description and Integration) and WSDL (Web Services Description Language) combine to form the first readily available set of technologies that implement Web Services. They are strongly supported (though not exclusively) by IBM and Microsoft. Web Services are discussed further in section 4.4.

5 What do you need for successful integration?

Success of B2B e-commerce depends on the quality of infrastructure integration, but is also influenced by many non-technical issues besides. Furthermore, there are factors that are peculiar to the context of cross-border e-commerce, where trading takes place between organizations that exist under different legal systems, languages and cultures. Some of these factors are also identified below.

5.1 New business models

To be more competitive in a global market, larger companies are seeking to acquire goods and services from specialist suppliers to reduce cost an improve efficiency. This requires close but flexible business process integration between partners, with greatest flexibility often required on the part of the smaller suppliers who are required to conform with the practices of the more influential partners in such supply chains.

SMEs in the Asia-Pacific or other regions may find the opportunity to be a supplier into a global supply-chain. They too may be under pressure to adopt processes of the existing partners. The new way of working within the supply chain will need close scrutiny to assess the costs and likely benefits. Such an arrangement may be difficult to refuse – whatever the cost – if no other viable business opportunities exist. For small companies, this is difficult enough within their own economy, but is certain to be further complicated by the needs of trading internationally. The attractiveness of a business model in the case of cross-border trading is likely to be further impacted by:

- Fluctuations in the exchange rate
- The cost of complying with overseas regulations regarding Internet trading
- The cost of complying with overseas tax laws, customs and tariff regulations
- The cost of trading in a multi-lingual environment
- The risk that foreign partners cannot in any practical way be held accountable under local laws, should disputes arise
- Cross-border security: The difficulties of establishing international, trusted trading environments, protecting privacy, providing reliable identity management on a global scale.

Despite these complications, the pressures driving businesses towards B2B integration continue to build. The Internet provides the opportunity to collect more business information, analyse it more thoroughly and respond to it more quickly. Similarly, improving customer service, drastically reducing time-to-market and costs become increasingly important. This is true for new ventures as well as in existing businesses: whether improving old delivery channels or creating them anew, integration technology makes it possible for information systems to become an integral part of business processes, and reap the benefits that come from exploiting the opportunities that IT and the Internet provide.

This means that information systems must also evolve at the same pace as the business itself. New business models must accurately reflect the current status of the organisation's business, serving as a basis for building B2B e-commerce systems.

The organization must also keep pace with the evolving business. Moving to the Internet requires change management. The organization's functions are built around the Internet business model; these functions require teams to work in different ways with new roles, which in turn require investment in skills training. It has frequently been reported that bolting an Internet business into the old way of doing things is problematic. Moreover, the organization must be flexible enough to deal with a much higher rate of change now and into the future. It has been noted that some of the key successful Internet-organisational factors are[4]:

- Vision in senior leadership
- Very fast decisions
- Decentralised structures
- Radical thinking
- Scenario planning

These issues need to be considered within the context of well-defined B2B business goals as previously discussed, such as reducing cycle-time and cost.

5.2 Language and Understanding

The spoken and written language has always played a critical role in all phases and aspects of conducting business. Communication and understanding are important when establishing trust and familiarity in trade relationships; they are then equally important elements of conducting business transactions. The importance of clear and unambiguous understanding means that trading internationally by any means has always been hampered by differences of language and culture.

Whilst the Internet offers the technology for global communication, it does little in itself to contribute to universal understanding. In addition, the picture of the World-Wide-Web as an English-speaking community is changing rapidly; many marketplace websites exist in European and Asian languages only. Automated translation offers some assistance but is not sufficiently accurate for business needs. Techniques known as Natural Language Generation (NLG), may improve on the accuracy of automated translation, but the precise uses, cost and benefits do not appear to have been studied in the B2B context.

There are now professional services available for localisation (i.e. translation) of websites (especially for e.g. B2C interactions), but this is costly because human professionals are used and updates are required as websites change. Moreover, such services are not appropriate for all aspects of B2B trading, where the issues of human interaction and

[4] http://www.globalchange.com/ebusiness.htm

common understanding are diverse and complex, and language needs are dynamic, depending on the context and state of a business transaction at any one time.

5.3 Technology

Despite the apparent diversity and range of products on offer, most enterprise-scale integration technology use for e-commerce solutions must include some common, key elements. What appears as new will often contain tried-and-trusted technology under the cover. Some common features include:

- Infrastructure to support synchronous and asynchronous communication, both within an organization and across the Internet
- Data transformation between applications
- Supporting services such as security and directories
- Higher-level business processes and workflow automation
- Mechanisms that provide gateways to other technologies

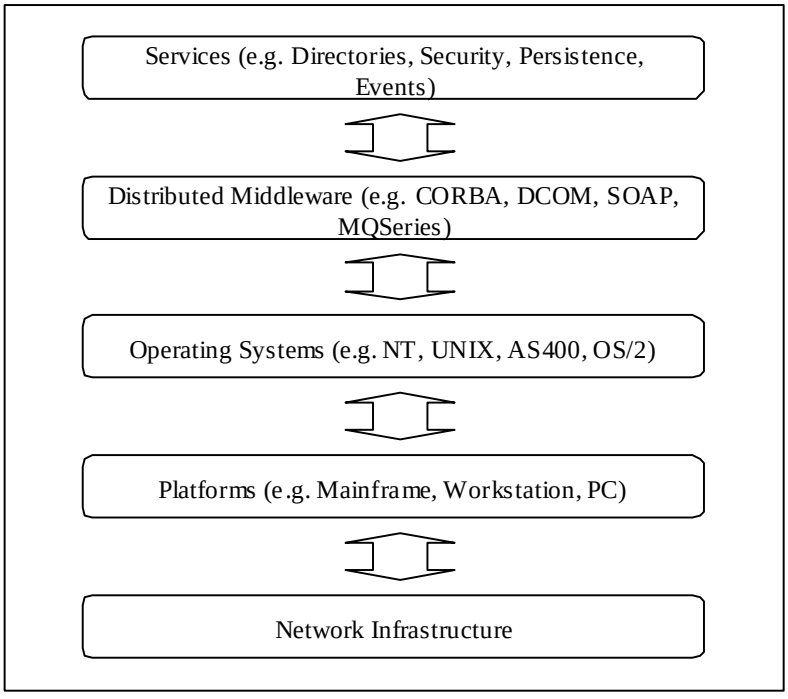

Figure 6: Network and middleware infrastructure components

It is the Distributed Middleware layer (see Figure 6) that is of interest here. This can be seen in terms of:

1. Traditional EAI messaging and queuing middleware (such as IBM MQ Series), an enabling technology for application integration. Data transformation and data

mapping is a critical component of EAI at this level. An intelligent rules engine helps in efficient routing the messages to appropriate destination.

2. Component–based middleware and applications (as implemented by e.g. CORBA and Enterprise Java Beans), delivering business solutions on top of the relevant middleware technology.
3. Business process automation, often implicit in EAI solutions. This area is where existing ERP vendors and new EAI vendors have teamed up to provide complete end-to-end integration solutions. Workflows that implement business processes are likely to call on the middleware services as described in (1) and (2) above.
4. Innovative, inter-organisational middleware such as Web services. Using XML-based standards wherever possible, these services offer the same kind of close integration across the World-Wide-Web, between organizations, that previously has only been possible with costly and complex distributed middleware such as the CORBA-based technologies.

The diagram below further illustrates typical elements of integration technologies and how they might be used both with and between organizations. The numbered figures are explained below.

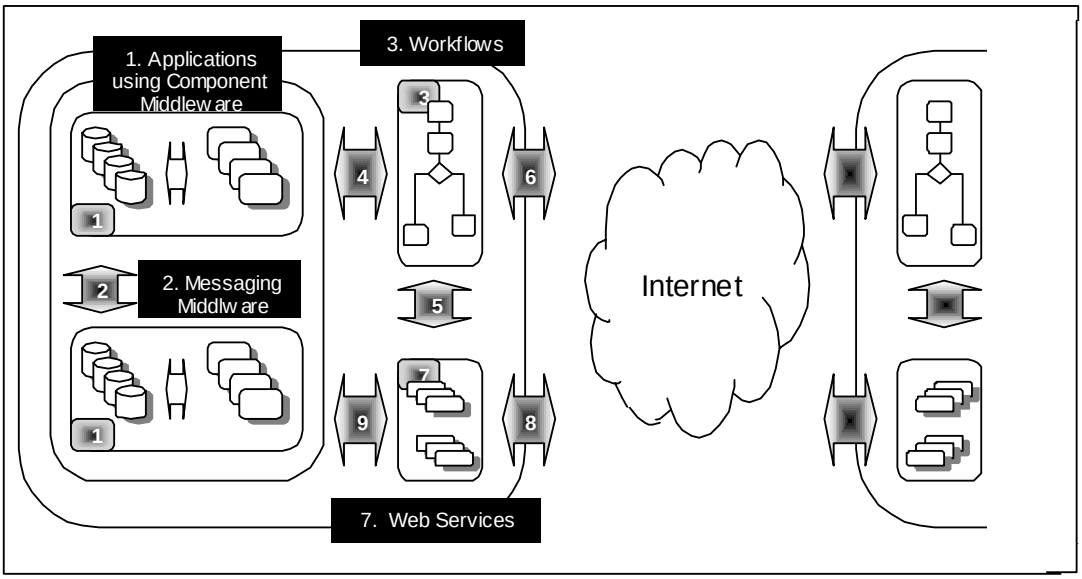

Figure 7: key elements of enterprise integration technologies

1. Applications using component middleware (e.g. CORBA, Microsoft's DCOM, Enterprise Java Beans)

Such component technologies enable the services of business applications to be invoked (relatively) transparently in a distributed environment. A group of closely related applications, perhaps managing related databases owned by a single division or

department, might offer services to each other and to the outside world using these technologies.

The products that provide the middleware infrastructure for component technologies are known as *application servers.* They provide services essential to high-integrity distributed applications such as: load balancing; flexible scalability to deal with unpredictable, bursty demand; security; high availability by enabling replication of business applications.

As depicted in the diagram, the business applications implemented by components (the 'boxes') are also responsible for managing databases (the 'cylinders'). Application servers are also responsible for providing transaction management to provide reliable database integrity in a distributed environment.

2. Messaging (asynchronous) middleware (IBM MQ Series, TIBCO, Microsoft MQ, Java Messaging Service)

Such messaging and queuing software can be thought of as a transport layer for EAI applications. As depicted above, it may be used as a means of loosely coupled communication between 'clusters' of closely related applications. Such a cluster might represent the applications and databases under the governance of a single department within an organization. In general this technology provides the ability to receive and deliver messages in a distributed environment. It is depicted above as a transport layer between application clusters within a single organization but can also be configured to send messages between organizations using the Internet or private networks.

3. B2B Collaborative Workflow Management (e.g. Microsoft Biztalk Server, BEA's Weblogic Collaborate, Fujitsu's I-flow

A new category of workflow tools are emerging specifically targeting inter-organisational collaboration through automated, common business processes. Some are built on existing workflow technology. The workflows are described using tools such as Biztalk Orchestration Designer. They might use the services of applications from within the organization directly using for example a CORBA or COM component (4); they can equally communicate by placing messages on queues within the organization and across the Internet (6). They may even discover and invoke Web services using UDDI and SOAP (5).

Many of these tools permit users to access directories and 'dictionaries' that contain descriptions of business message payloads. Typically it is now the case that these are described using XML. Some also permit access to similar repositories of pre-defined workflows, also typically described using XML. For example, BEA's Weblogic Collaborate has extensions to specifically deal with RosettaNet's 'standardised' workflows known as Partner Interface Processes (PIPs).

7. Web Services (SOAP, UDDI, WSDL)

As described previously, Web services provide direct programmatic access to application services in much the same way as the synchronous middleware technologies such as CORBA and COM described in (1). Some important points to note are:

- Web services are specifically designed to provide access to applications by external parties 'across the Web'. SOAP is a standard way of describing the payload format for application interfaces using XML; these payloads are then typically wrapped up in a HTTP transport layer, which takes the request through organisational firewalls without any difficulty.
- Web services using SOAP make no assumptions about how the application is implemented; it may be a CORBA or COM component, or some legacy application. Whoever uses this service doesn't need to know these details.
- Basic web service technology using SOAP is cheaper and simpler to implement than the typical application server technology that would be needed for e.g. CORBA or Enterprise Java Beans. This is because it is simpler technology that provides fewer, less sophisticated services than the typical enterprise application server.

Returning to Figure 7, we can see how SOAP services might be used. Once made available in a UDDI directory (7), the Web services can be invoked using SOAP by other organizations across the Web (8). The SOAP service might map to an in-house application accessible through an application server (9) or perhaps directly to a legacy system.

There are an increasing number of vendors offering a wide variety of integration products that have application in B2B e-commerce. For example:

- In the family of Java-based application servers[5], there were only a handful on the market 18 months ago. Now there are 49 such products listed on the relevant special interest group website[6];

Although only months old, the novel technologies emerging to implement 'Web services[7]' are already available as products from vendors like IBM and Microsoft, as well as smaller organizations like Cape Clear. As noted previously, they are designed to provide tightly coupled integration across the Web, potentially at much lower cost that was previously possible. The number is certain to grow in the coming months.

5.4 Common data system

Finding ways to unify or standardise on business message and data formats is one of the major problems that must be addressed by B2B integration. Organisations often have the same or similar information in a wide variety of data formats. When an application sends a message to another application, its connector (or adapter) first translates the message into a standardised form. When the message is received by the target application, another

[5] More specifically, servers for 'Enterprise Java Bean' (EJB) technology, as specified in ' Java 2 Enterprise Edition'

[6] http://www.mgm-edv.de/ejbsig/ejbservers_tabled.html

[7] As discussed in section 6.3.4

connector translates the standardised message into the target application's native format and protocol. Data transformation or data translation can be thought of as a universal translator (e.g. ASCII to EBCDIC format, Ingres schema to Oracle schema) and one that maps data between applications.

The costs and complexities of multiple data transformations are considerable. For this reason, common data standards including XML, EDI and OBI are particularly valuable for e-business application integration.

EDI in particular has a long history of providing a common messaging framework for electronic 'paperless trading', and is deployed across a wide range of industry sectors in many econokies world-wide. Two standards bodies, The Accredited Standards Committee X12 and the UN/EDIFACT Working Group, are behind the world's most widely used messaging standards for EDI. Both groups are now cooperating with the XML-based electronic business XML (ebXML) initiative, to provide a single, harmonised set of standards for conducting e-business in the future. XML provides a way to move to self-describing and validated data around networks. Besides ebXML, several other XML-based initiatives have gained considerable industry momentum. Trading communities including the world of finance, travel, the automotive industry, are building business-specific standards for common data systems using XML. Some of these are discussed further in Section 6.

5.5 Universal communications and connectivity

The Internet has solved the major connectivity problems for many businesses around the world. Even small- and medium-sized companies can now easily reach customers and trading partners across the globe. The Internet provides:

- A reliable communications backbone
- standardised and near-universal connectivity
- lower distribution costs for information
- increasingly higher bandwidth
- improved information currency

Moreover, the availability of common high-speed digital networks provides the basis for the convergence of existing media and networks and the provision of new services. The new digital network carries voice, high quality audio and video. The capability and flexibility of Internet technologies and infrastructure are leading to the convergence of the existing telephone, data and video networks. In near future, homes and businesses in many parts of the world will have a single Internet connection that will provide high-speed connection to all major services, including telephone, video, the Web and e-commerce.

This is not to say that all problems have been addressed however. Maintaining universal and constant connectivity between supply chain partners and other business units (see Figure 8) can still be an unreachable goal for some. Many organisations still use unreliable and intermittent dial-up connections, which hinders effective 7x24 hours

communication across the globe. In many regions of the world, Internet access is still not possible due to a lack of basic network infrastructure. These matters will be further discussed in section 5.

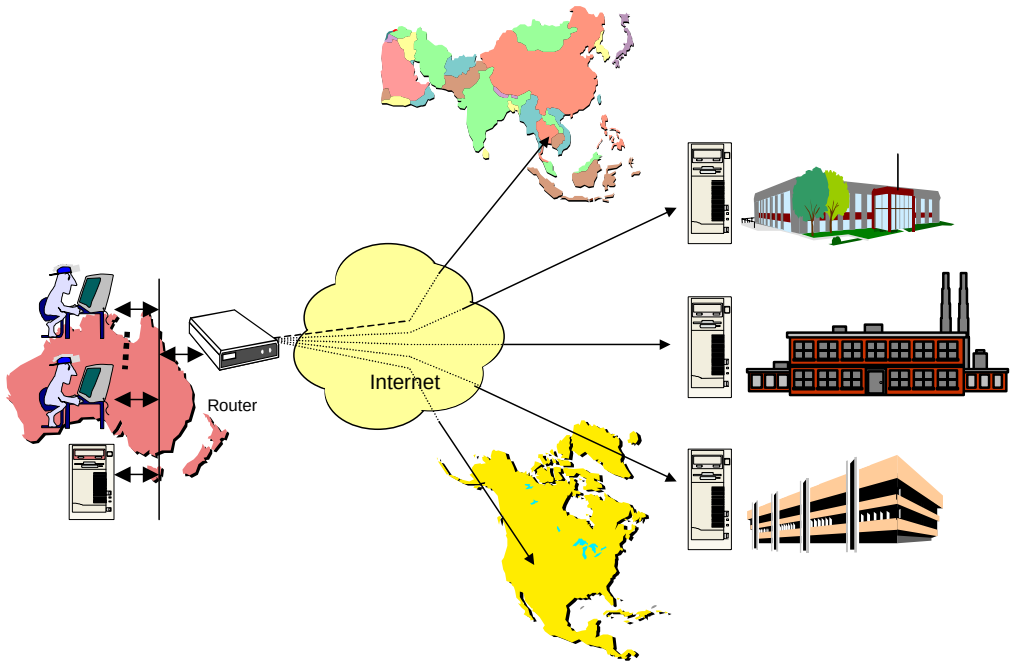

Figure 8: Universal connectivity

The Internet offers universal business connectivity in ways that have not previously been possible with private networks. For example, implementations of EDI standards over value added networks (VANS) have been in place for many years. Whilst running these networks has been costly, much of the infrastructure developed for them transfers well to the Internet where the benefits of cheap networking can be gained. The Internet offers a flatter pricing structure than private, leased lines, where charges are linked to the volume of data transferred. Moreover, an Internet connection is far more flexible, in that it can be used for multiple purposes – email, website browsing, as well as business message transfer.

Traditional VANS do have some advantages however: they offer stronger guarantees of bandwidth provision and network availability; most importantly perhaps, security and trust models are less vulnerable, despite the world-wide efforts to secure the Internet. Firewalls, secure connections, encryption and PKI implementations do not alter the fact that a public network is open to attack in ways a private network is not. Similarly, in the closed trading communities that operate over VANs, the risks of identity theft and misuse are far less significant.

5.6 Security and trust

Commerce has always relied on building trusted relationships with partners and protecting interests through secure business practices. The fundamental issues are no different with Internet-based electronic commerce. Many people feel however that the Internet is not secure and that threats are amplified by the sheer scale and public accessibility of the Internet. It is true that connecting an internal network to the Internet can expose the internal systems of a company to very considerable risks. The transmission of a document between two parties over the Internet may result in the document passing through half a dozen networks, each managed by different organisations.

Conversely, technology also offers new ways to protect assets (e.g. encryption, digital signatures, firewalls).

For small to medium-size companies, e-commerce security is a balancing act that has to be seen in terms of risk management. If they are to integrate their information systems with global supply-chains, the risks associated with security and trust should be viewed from several perspectives:

- As a supplier that the supply-chain relies on: how trustworthy and secure is the company and its own IT systems from the partners' perspectives?
- As a supplier that relies on the rest of the supply-chain: how trustworthy and secure are the partners and their IT systems from the company's perspective?
- As an organization whose IT systems are reachable on a public network: how well protected are these systems against malicious or accidental attack by 3rd parties?

The following are key issues that need to be addressed from the perspective of one or more of the above viewpoints.

Managing business partner identities: the potential for greater speed and scale of Internet trading may encourage organizations to risk doing business with organizations they know little about. The steps that should be taken to exercise due diligence regarding commercial partnerships is largely outside the scope of this study. However, it should be noted that companies could adopt measures to manage knowledge about the identity of their trading partners. Lists or simple databases might be retained containing information such as:

- Who they trade with
- How well they are known
- Evidence for the degree of their trustworthiness
- Currency of above information

Similarly, businesses should bear in mind that they will be under reciprocal scrutiny of their trading partners.

Accountability and Non-repudiation: Trust can develop quickly between trading partners who show that they are prepared to stand by the deals that they enter into. Equally, in the

electronic world, there is an increased risk that unscrupulous traders will try to deny that they were consenting participants in an event (such as a transaction). Therefore, legitimate traders need mechanisms to support 'non-repudiation' – that is, ways of ensuring that participants in an electronic transaction cannot credibly deny that it took place. Digital signatures using Public Key Infrastructure (PKI) are now a common means of non-repudiation: if a company's public key unlocks a message, they cannot deny that it was signed with their private key.

Such mechanisms need to be supported by credible logging practices so that audit trails can be reconstructed if necessary.

Authentication: it must be established that people and businesses really are who they say they are. Public Key Infrastructure and digital certificates is now a common means of authenticating people, businesses and software. If a company's public key unlocks a message successfully, it must have been signed with their private key, thus authenticating the message.

Integration quality: it is important that there is mutual confidence between a company and its trading partners in their respective IT systems in terms of how reliably and securely they interoperate. For example, the following should be monitored to the extent possible:

- That business messages are reliably routed end-to-end without loss and without malicious or accidental corruption;
- That IT systems of partners have satisfactory external security measures in place – i.e. the use of firewalls;
- That IT systems of partners are high-integrity 'behind the firewall' – i.e. they do not corrupt, misuse or lose data internally.

Privacy: Confidential data must be visible only to the intended viewers, within the company itself and in partner organisations. This is true of information stored in files and databases, as well as messages in transit over the Internet. For stored information, access control technology can provide adequate protection, but only if it is supported by appropriate policy and processes. For information in transit, encryption technology can provide adequate privacy protection.

Access control technology includes:

- passwords and PINs, encrypted smart cards and biometrics, to ensure that only valid users and applications get access to information resources such as user accounts, files and databases
- a variety of firewall configurations, to exclude unwanted access from 3rd parties, whether malicious or accidental.

Access control policy should ensure that:

- satisfactory organisational security policies are in place – i.e. that confidential data is seen only by those who need to know

- security is not threatened by inappropriate organisational practices – i.e. casual attitudes to passwords, PINs and the like
- Organisational roles that access confidential data are enacted only by nominated, trusted individuals.

Security standards and technology are discussed in section 6.6. Issues and challenges regarding security and trust are discussed in section 7.5.

5.7 Legal frameworks

New business models and technologies will be subject to similar regulatory controls as existing processes (Figure 9). However, Internet trading gives rise to situations that are not adequately covered by pre-existing laws. The legal status of digital signatures is one example; how sales tax laws apply to Internet purchasing is another. Again, uncertainties here are only amplified by crossing jurisdictional boundaries, where conflicting laws may leave the trader uncertain about which are applicable.

Despite these difficulties, appropriately modified regulations and laws must cover Internet-based payment methods and new communication technologies. If an organisation conducts business within a regulated environment, such as law, medicine, or international trade, there may be requirements to keep transaction records for future audit.

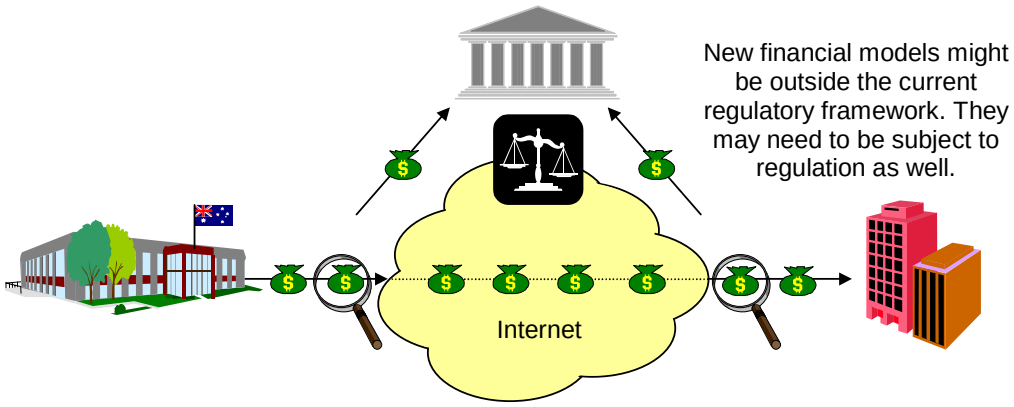

Figure 9: Regulatory control is needed for new financial models

In the era of e-commerce, organisations and consumers wish to be protected against unlawful activities in the same manner as they are protected in conventional commerce. Professional organisations will also need to update their codes of practice to accommodate e-business practices.

A legal framework, judicial and government instruments should be in place to protect the privacy of consumers, unlawful activities and trade practices to enable e-commerce. Using Internet, as shown in Figure 10, criminals and hackers have access to computers anywhere in the world. Tracking down the source of attacks across jurisdictional boundaries requires international cooperation and agreements.

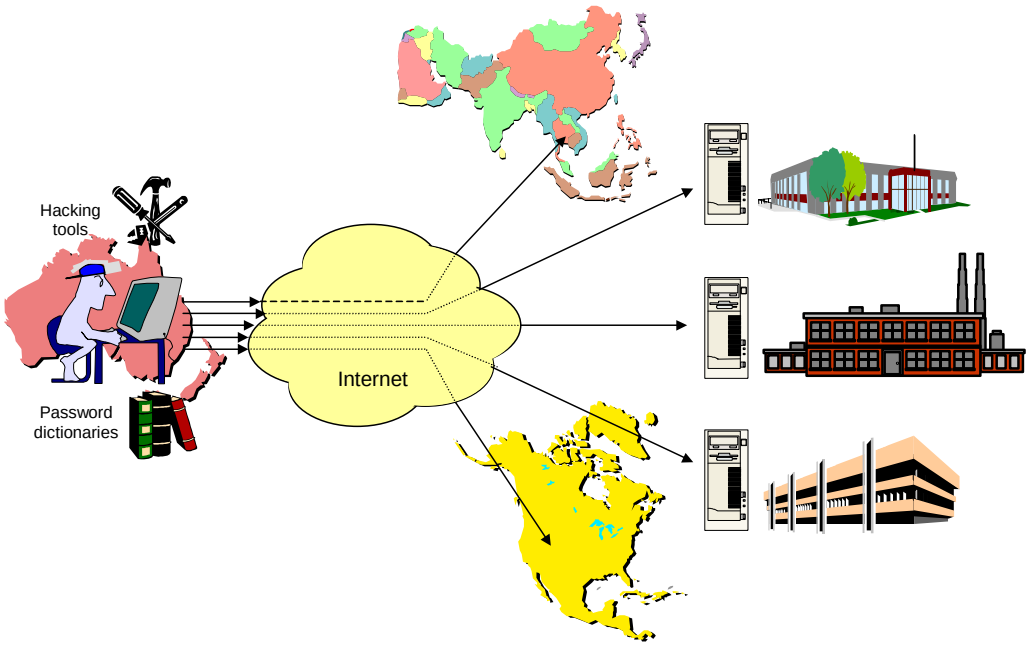

Figure 10: A criminal hacking sites throughout the world

The key consumer issues with payment systems include:

- Consumer protection from fraud arising from efficiency in record keeping.
- Transaction privacy and safety.
- Competitive pricing of payment services to ensure equal access to all customers.

Issues and challenges regarding legal and jurisdictional infrastructure are further discussed in section 7.6.

6 Network Infrastructure

The rise of global e-commerce is a direct result of the growth of the Internet. Many organisations used to integrate their application systems with those of their business partners but these collaborations were built on top of private, closed networks. For example, the SWIFT network has long been serving the needs of the banking community, using private and highly secure links between economies and participating banks. EDI has also been a widely used approach to supply-chain integration. EDI users exchange messages formatted according to industry or international standards, often over expensive private networks called Value Added Networks (VANs) or via e-mail.

The Internet changed everything by introducing universal connectivity, and now every computer system in the world was potentially connected, via a single worldwide network. Businesses could now reach collaborators and partners easily and inexpensively, and widespread e-commerce really became technically possible and financially attractive. Computer networking had been turned into a utility, akin to telephones and power.

E-commerce is a very broad term, and different types of e-commerce place different demands on the network. The main network characteristics to be considered are availability and bandwidth.

Availability is how much of the time a computer system is connected to the Internet. A system that is only acting as a client, placing orders for example, only needs to be on-line from time to time. The system that is accepting orders needs either to be on-line continuously or the underlying software systems needs to be able to save up requests until it is next available. Different levels of availability can be accommodated by appropriate application architectures and software infrastructure.

Bandwidth is how much data can be transferred over a connection. Bandwidth can vary very widely, from hundreds to millions of bytes per second, depending on the technology used and the state of the available communications infrastructure. The bandwidth required for e-commerce can also vary widely, depending on the type of e-commerce and the software infrastructure used to support it.

6.1 Networking requirements

Different types of e-commerce require different minimum levels of availability and bandwidth. For example:

- A manufacturer who needs to be totally integrated into customers' supply chains will need to be continuously on-line so that they can accept orders at any time and answer queries about stock availability and pricing. The bandwidth required may not be very high though, and may even be met by modem connections running over telephone lines.
- Another manufacturer may accept orders over the Internet, but only be on-line for an hour or so a day. Customers can send in their orders at any time and these will be saved somewhere in the network until the manufacturer's system is next

available. Bandwidth requirements can also be quite low, as incoming orders come in as batches, possibly having waited for hours or days already.

- The highest level of requirements for availability and bandwidth arise for businesses engaging in direct selling over the Internet, using systems that support interactive purchasing. Availability has to be high because customers expect the system to be available when they want to browse or make their purchases. If the system is unavailable they will quite likely do their shopping elsewhere. Bandwidth requirements tend to be high because customers expect rich, graphical Web interfaces, with pictures and details of the goods being offered for sale. This class of business needs to have direct, high-bandwidth connections to the Internet, and dial-up modem connections will not come close to meeting these needs.

6.2 The Core Network

The backbone of the Internet now runs over fibre-optic cables. These cables are made up of a number of thin glass fibres carrying pulses of light and offer extremely high bandwidth. Modern optical techniques, such as Dense Wave Division Multiplexing (DWDM), support many different high-bandwidth channels at the same time over the same fibre. The capacity of fibre optic cables is measured in Gigabits/second, and this is increasing every year as the DWDM equipment allows more wavelengths to be used on the same fibre. As an example of a current fibre optic link, the Southern Cross cable that links Australia, NZ, Fiji and the USA is 30,500km long and potentially offers 480 Gigabits/sec across the Pacific. This amount of bandwidth could support 80,000 concurrent high-quality video streams, over only six glass fibres.

Major intercontinental and cross-continental fibre-optic networks are being installed at a rapid rate, and many economies now have access to high-speed international network links. Economies such as China are installing large-scale fibre optic networks, and building high bandwidth network backbones, as the foundation of a modern communications infrastructure. China plans to have 2.5 million kilometres of fibre optic cable installed by 2005, including 500,000km of long distance links.[8]

Fibre optic cables have largely supplanted geostationary satellites[9] for international trunk routes, offering much greater capacity and lower transit delays (latency). These high-orbit satellites are now largely restricted to broadcast applications, such as television, and for networking in areas where laying cable is not feasible or economic.

Fibre optic technologies have largely solved the technical problem of meeting demand for capacity in the core networks, both internationally and within some developed economies. Indeed, on many routes there is now more capacity than demand, with ‘dark’ fibre being kept in reserve for future needs. This does not mean that the larger problem of providing network infrastructure is solved however. Laying a new nation-wide fibre optic

[8] http://www.s-c-i.com/news/01-02-19.htm and http://www.chinaeco.com/ecit/rept/c5350h02.htm

[9] Geostationary satellites are in a high orbit that enables them to match the Earth’s rotational speed and stay over the same spot on the ground.

network will result in a high quality network, but at a considerable cost, and one that may be hard to justify in many economies.

6.3 Satellite Networks

Geostationary satellites have moved over the last decade or so from being at the centre of international communications to only being used as a backup to cable networks and for specialised markets, such as providing access to remote areas. This change is the result of both the limitations of high-orbit satellites and their cost.

The basic problem faced by geostationary satellites is simply that they are so far away from the Earth. In order to stay in the same spot above the Earth's surface, these satellites need to be in an orbit 36,0000km high. This distance results in transit delays, as the radio signals take about 1/3 of a second to travel to the satellite and back again, and fairly expensive ground stations, including large antennae ('dishes') and powerful transmitters. Figure 11 shows the delays incurred by geostationary satellites compared to alternative technologies.

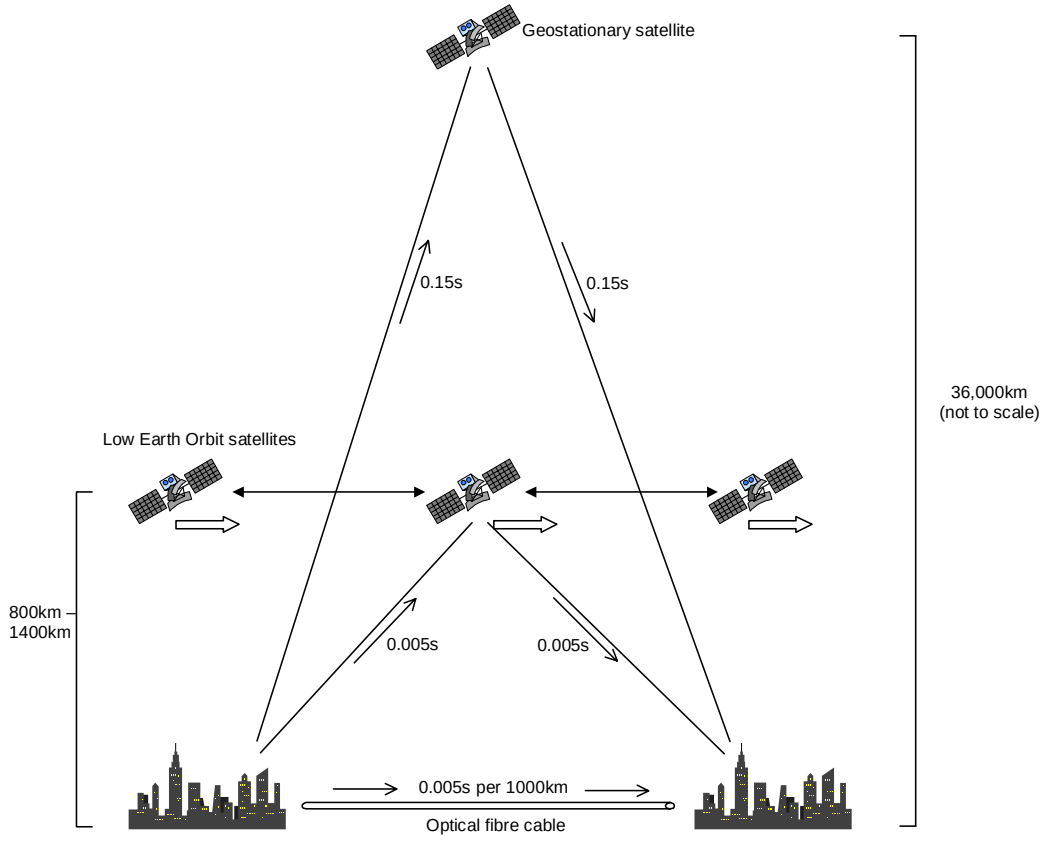

Figure 11: Comparison of speed of satellite and cable links

Despite these possible difficulties, geostationary satellites are currently the best choice for providing network access in remote and less developed parts of the world where there is no existing cable infrastructure or it would be too expensive to construct.

A lower-cost alternative to the full use of geostationary satellites is to use them in conjunction with other land-based technologies, such as modem connections. Users of this approach get their incoming network traffic from the satellite, using relatively cheap equipment, and send back their responses over conventional land-based networks. This reduces costs as powerful transmitters are not required, but works only when the user needs to receive much more data than they send. This is typically the case for end-users, such as people browsing the Web, who send off quite small requests and receive large, graphical Web pages back in return. It is less likely to be useful as a way of supporting e-commerce, as most businesses need to be able to both send and receive information equally well.

The nature of satellite communication may well change over the next few years. There have been plans for 'Low Earth Orbit' (LEO) satellite data networks some a few years now. The networks use satellites orbiting at only about 800km above the Earth's surface. This low altitude reduces transit delays, as shown in Figure 11, and the need for expensive, high-power, ground stations. The first generation of LEO satellite networks, such as Iridium, were aimed at providing global telephone coverage, not at data networks, and proved to be commercial failures due to competition from terrestrial mobile phone networks. The second-generation networks, such as Teledesic, are focussed on providing access to the Internet, although they too may run into competition from the next generation of mobile phone technologies.

If the LEO data networks are launched, they could provide moderately high bandwidth (up to 64Mb/s), constantly available connections to any point on the earth, without the need for large-scale cable rollouts.

6.4 Modems and Cables

The problems of providing bandwidth and availability in the core network are largely solved. Fibre optic cables can provide very large amounts of bandwidth to many parts of the world, and satellites can provide reasonable bandwidth to almost everywhere else at the expense of building and operating the necessary ground stations. The real problem to be solved in almost every economy is how to provide the link between the end-users and the core network – the so-called 'last mile' problem.

The 'last mile' problem has many solutions that vary in their cost, effectiveness and impact on existing infrastructure and investments. These range from simple modem links running over existing telephone lines, through various wireless and direct satellite solutions with the most expensive and effective option being fibre optic cables running directly into homes and business premises. Making choices amongst these alternative technologies is difficult, and depends as much on the state of the local communications infrastructure as anything else.

For economies with well-developed conventional telephone networks, the cheapest and easiest way to provide Internet access is to make use of this existing infrastructure,

accessing the Internet over the telephone network. In the past this has been done largely through the use of 'modems' or ISDN links. Current modems are limited to at most 56Kb/s on good quality telephone lines, and their bandwidth degrades along with line quality. Modems have the advantage of being cheap and running over the telephone network, and 40Kb/s or so is quite enough for many types of e-commerce. ISDN links provide a higher quality, and higher cost, direct 'digital' link into the network, offering 64Kb/s (or 128Kb/s using 2 data channels). ISDN has been available for a number of years, but the higher cost of ISDN and its limited bandwidth has meant that it has never become widely used.

The availability of low-cost signal processing chips has lead to the introduction and rapid adoption of Digital Subscriber Line (DSL) technologies that take advantage of the bandwidth that is really available from good quality telephone lines. There are many 'flavours' of DSL available, with differing bandwidth and characteristics. Even the slowest of these offer bandwidth around 500Kb/s, and the fastest offer download speeds around 10Mb/s, enough for high quality video. DSL is a good choice for those economies who already have a high quality telephone network, letting them provide broadband network access without the costs of digging up their copper cables and replacing them with fibre optics. DSL is also a good choice for businesses as it is 'always on', providing the continuous network connectivity needed for many types of e-commerce.

Cable modems are an alternative to DSL for those areas with an existing cable television infrastructure. Cable modems provide similar bandwidth and availability to DSL over the cables used to deliver television, again making effective use of the installed infrastructure.

Both DSL and cable modems are good choices for those economies that have already invested in telephone and cable television networks, letting them leverage their existing infrastructure. These copper-based networks will probably be replaced with fibre optics over time, but the cable rollout costs are too high to justify any time soon, given that the copper-based network infrastructure is already installed and working.

6.5 Wireless Networks

The alternative to cable-based networks is wireless, both fixed and mobile. Wireless is a particularly attractive option for those economies that have not yet made the considerable investment needed to build conventional cable-based networks. They now have the alternative of just building fibre optic trunk networks and using wireless technologies to provide the link into homes and businesses. This hybrid approach provides good bandwidth and availability with lower rollout costs.

The two major wireless technologies are local microwave links (LMDS and MMDS) and mobile telephones. The second-generation mobile phone technologies, such as GSM, were designed primarily to carry voice traffic, although they are digital technologies and transport phone conversations as packet of data. These mobile technologies can also be used for carrying data, but they only offer low bandwidth and users are normally charged at mobile phone rates for as long as they are connected to the network. These failings are being addressed by newer technologies, specifically designed to offer data access at a

lower-cost and with higher bandwidth and constant connectivity. These newer mobile data access technologies have already proven to be very popular with consumers in Japan and Korea.

General Packet Radio Services (GPRS) is a GSM technology that provides access to the Internet using packet switching rather than dedicated circuits. GPRS lets many users share a higher capacity data channel, giving them a maximum rate of 115Kb/s and only charging for data that is actually sent or received rather than for connect time. This service will be both cheaper and faster for most users, and businesses could connect to the Internet using GPRS with reasonable bandwidth and constant availability.

The 'third-generation' (G3) mobile phone technologies are much more focussed on providing good access to the Internet. They are promising shared access up to 2Mb/s, with constant availability and are expected to be widely available within a few years.

LMDS is a fixed equivalent to cell-based mobile phone technologies. Users install small microwave transceivers that link them to a nearby (and visible) base station. The base station transmits to all users in the cell ('sector'), and the return path uses direct point-to-point links from the users to the base station. Data transfer rates for LMDS are likely to be quite high, up to hundreds of Mb/s, offering high bandwidth without the cost of laying fibre. The use of microwaves that gives LMDS its high bandwidth also means that connections can be 'washed out' in heavy rain, somewhat limiting their use in tropical environments.

Wireless technologies are particularly attractive for areas with both high population densities and little existing cable-based communications infrastructure. Fibre optic cables or satellites can be used to link G3 or LMDS base stations to the core network, and then wireless technologies can be used to provide the 'last mile', avoiding the considerable costs of digging up city streets and laying cable.

The rise of global e-commerce is a direct result of the growth of the Internet. Many organisations used to integrate their application systems with those of their business partners but these collaborations were built on top of private, closed networks. For example, the SWIFT network has long been serving the needs of the banking community, using private and highly secure links between economies and participating banks. EDI has also been a widely used approach to supply-chain integration. EDI users exchange messages formatted according to industry or international standards, often over expensive private networks called Value Added Networks (VANs) or via e-mail.

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7 E-commerce Standards and Technology

In the world of information technology, there appear to be more special interest groups and standards initiatives than ever before. Many of these are directly related to e-commerce, nearly all of them indirectly so. This proliferation is a consequence of the scale and vigour of activity in e-commerce technologies globally. It is important to realise that the situation will not always be as chaotic as it is now. The dust will settle: there will be winners and losers, in terms of both standards and technologies.

With so much happening, it can be hard to understand the relevance of a particular initiative and even more difficult to grasp how one relates to another: are they complementary, competing, or quite independent? These complexities are compounded by the rapid rate of change: technologies mature and evolve; initiatives come and go; relationships turn around completely.

Groups that yesterday seemed to be in competition begin to harmonize; for example, elements of the ebXML[10] community were in the past critics of the SOAP[11] protocol. Since February 2001, with some agreed modifications in place, efforts have been under way to integrate SOAP into the ebXML messaging layer.

Similarly, some groups that used to be pivotal have seen their influence diminish. The Object Management Group[12] played a critical role in the development of distributed computing standards and technology but its role in the world of e-commerce, through its business-oriented standards, has been less prominent.

Other initiatives have withered on the vine already. SMBXML[13] for example, an XML-based open standard that specifically attempts to simplify XML e-commerce document types for SMEs, has remained in the shadow of much grander initiatives like ebXML.

Whilst it is impossible to predict exactly what the future will look like, there are some trends that are already observable:

- Elements of the large-scale infrastructure initiatives will continue to converge and harmonize. The recent publication of the XML schema standard from W3C will do much to contain the XML "Tower of Babel[14]"; the adoption of SOAP by ebXML will help contain the messaging integration costs in future e-commerce applications. UDDI[15] currently provides directory and resource discovery infrastructure for the so-called 'web services' model. In doing so it provides a counterpart to ebXML proposals in the same space. They also are good candidates for harmonization.

[10] http://www.ebxml.org

[11] http://msdn.microsoft.com/xml/general/soapspec.asp

[12] http://www.omg.org/

[13] http://www.smbxml.org

[14] http://www.internetweek.com/indepth01/indepth042401.htm

[15] http://www.uddi.org

- XML-based business models are more likely to succeed where they are superimposed on existing stable and successful trading communities, where the business value – most probably efficiencies in cost and time - is clear. This is the case for RosettaNet[16] in the semiconductor industry and Financial Products Markup Language[17], which is used by the financial derivatives trading community. The relative stability of these communities means that they can afford some time to 'get it right'; the fpML initiative was in progress for several years before a specification was released, but that time was critical in developing an understanding of what should and should not be proposed as a standard.
- On the other hand, many of the XML business standards will fade rapidly. It has been claimed that "Most of these [XML] schema will be dead in two years[18]". This will be largely because the business models in which they are used will fail or because the interested parties are trying to standardise too much too soon. It is one thing to standardise a purchase order but quite another to formalise and standardise a complete business process. The latter may make good sense for well-defined supply chains such as the semiconductor or automotive industries, but may always be gilding the lily for one small business dealing with another.

Emerging issues in standards and technology, and how they affect e-commerce, are discussed below. We will address:

- How XML is used in e-commerce, and some technical issues it raises;
- How trading communities are organising around business standards based on XML;
- The more general e-commerce architectures and frameworks that have been proposed, and how they are developing;
- The role of e-commerce technology vendors in the e-commerce community and the nature of their offerings.

7.1 eXtensible Markup Language (XML)

XML has rapidly become the accepted basis for describing messages, documents and workflows in most e-commerce standards. Its history, relevance and use are reviewed below.

[16] http://www.rosettanet.org

[17] http://www.fpml.org

[18] Rita Knox, Gartner Group. Reported in "XML's Tower of Babel": http://www.internetweek.com/indepth01/indepth042401.htm

7.1.1 Overview

XML[19] is the most recent addition to a family of document mark-up languages that includes SGML and HTML. Technically speaking, XML is a simplified subset of the Standard Generalized Markup Language (SGML, ISO 8879).

SGML and HTML are technologies that are about organising, structuring and displaying documents. XML is similar, with a focus on describing content rather than content and presentation. In other words, XML is about *what* is in a document rather than *how* it is going to be formatted and presented to a human observer.

In itself, a simple XML document is a fairly unremarkable object. Its major component is text that contains essential information, or document content, surrounded by 'tags' that describe what that content represents. Part of XML's appeal is that both humans and computer software can read it, although on its own, it could be argued that XML is optimally designed for neither. XML requires software to be presented well for both human and automated comprehension. Presentation for humans is via XSLT style-sheets; for software, via XML interface mechanisms such as the Simple API for XML (SAX) and W3C's Document Object Model (DOM) (see Figure 12).

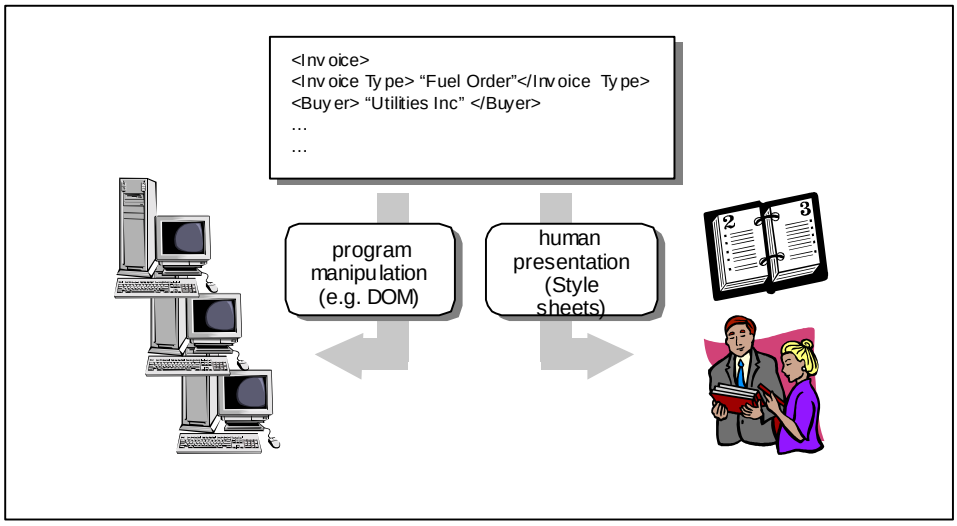

Figure 12: XML is processed for manipulation by software or presentation to human readers

Its tagged structure and representation as text make XML documents much larger than the essential information they contain. For this reason, XML documents are often described as being 'verbose'. Some of the issues this raises are discussed in section 6.1.3.

Until recently, there was no single standard for standard for XML schemas (which allow a set of related document types to be defined). The World Wide Web Consortium (W3C)

[19] http://www.w3.org/XML/

has now released the XML Schema definition as a W3C recommendation[20]. This appears to have wide industry support from major vendors such as IBM, Microsoft and CommerceOne[21].

7.1.2 XML in E-commerce

The lineage of XML as a mark-up language does little to indicate its true significance in the context of e-commerce. It is well on its way to becoming a universal language for describing business application payloads that are to be transported across the Internet. Purchase orders, invoices, receipts and the like are easily represented as XML documents. XML is becoming the *lingua franca* for electronic information exchange between business partners around the globe. Whilst its significance should not be underestimated, XML is a giant in the world of e-commerce because it rides on the back of much that has gone before.

EDI is one such example: XML has had a far greater impact in a wider business arena than the limited use of EDI within some industries, but the rapid penetration of XML is in part due to the whole 'EDI experience'. Indeed, EDI message formats have been adapted for XML.

Above all however, it is the phenomenon of the Internet that has enabled the rapid, global uptake of XML for e-commerce purposes. As a technology for describing business messages, XML is the icing on the Internet cake.

7.1.3 Issues with XML in E-commerce

As noted earlier, XML is generally considered a 'verbose' way of describing information. Whether or not this is a concern depends on what you are comparing an XML document with, and what you will be doing with it. The main issues here are:

- the impact on demand for bandwidth that large XML payloads will create. This may not be problem for high-performance broadband networks, but it will be a different matter on slow modem links.
- The impact of large XML documents on computing resources. Less powerful computers may struggle to process XML documents quickly enough, particularly if many such tasks must be undertaken simultaneously.

Because of the general problem with size and verbosity of XML documents, software tools known as XML compressors have appeared. These tools deflate and then inflate XML documents as needed. Because they understand the structure of XML documents and exploit that knowledge, they will normally perform better than general text compression tools such as GNU zip (gzip)[22].

[20] http://www.w3.org/XML/Schema

[21] http://www.w3.org/2001/05/xml-schema-testimonial

[22] http://www.gzip.org

To illustrate some of the issues regarding size, some XML documents have been created and compressed with the results presented in the table below. Three rather different contexts are considered: firstly, a Microsoft Word document is 'converted' into XML using a 'for-free' word processor[23] that generates XML. The result is much smaller than the original. Secondly, and EDI document has been translated to XML[24]. The result is about 20 times larger than the original. The third document is a sample invoice in XML from Biztalk[25].

Original Document Type	Original Document Size	XML Version	Compressed XML	Approximate Compression Ratio
Microsoft Word	71680	42929	5233	8:1
EDI	614	12055	2326	5:1
Biztalk - Sample Invoice	-	3593	1290	3:1

In all cases, an XML compression tool is then applied. The compressed EDI - XML document is about 5 times smaller than the original XML document and about 4 times larger than the original EDI document. The 'Word' document in XML compresses quite well, but the Biztalk invoice does not. In this case, an ordinary text compressor such as Gzip may have done just as well. The results here are obtained using a 'for-free' XML compressor[26] – other commercially available tools claim much higher compression ratios (e.g. 45:1)[27].

The ability to reduce the size of XML payloads is attractive, but:

- The compression ratio, which may be critical, is highly context-dependent
- there will be an unavoidable performance penalty – compression and de-compression must take time and computing resource.
- In a low bandwidth context, less verbose alternatives to XML – including text-based EDI documents – may offer useful performance benefits.

An overview of XML compression and related issues is available through OASIS[28].

[23] Abiword: http://www.abiword.org

[24] as described at http://www.xml-edifact.org/TR/NOTE-xml-edifact.html

[25] http://www.biztalk.org

[26] Xmill from AT&T – available at http://www.research.att.com/sw/tools/xmill/

[27] e.g. http://www.ictcompress.com

[28] www.oasis-open.org/cover/xmlAndCompression.html

7.2 Trading Communities and Standards Groups

There are many different groups involved in defining standards relating to e-commerce. In broad terms we can group them as follows:

- General Internet, World-Wide-Web and standards groups such as The World Wide Web Consortium (W3C) The Internet Engineering Task Force (IETF)
- General business document/messaging standards groups such as OASIS and UN/EDIFACT
- 'Open' community initiatives such as Biztalk
- Increasingly more focussed 'community of interest' business standards such as EDI/XML, OBI and RosettaNet
- Trading community standards, as exist in the word of finance and banking, such as bolero.net and FINXML
- E-Commerce Frameworks & Architectures such as Web services, ebXML and the Eco Framework
- Technologies and systems from companies such as IBM, Microsoft, CommerceOne and Ariba.

Whilst the role of organizations in these groups may be straightforward enough, the relationships between them is often less clear. Both are addressed below with regard to selected initiatives.

7.2.1 General Standards Groups: World Wide Web Consortium

The World Wide Web Consortium (W3C) was created in October 1994 to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability. In April 2001, W3C membership numbered more than 500 member organizations from around the world.[29] The organisation has earned international recognition for its contributions to the growth of the Web.

The main role that W3C plays for the e-commerce community is the guardian of relevant XML standards. One example of particular importance to e-commerce is the newly defined XML Schema[30]. It is also possible that W3C will become the keeper of the standards that emerge from the ebXML[31] initiative now that the18-month process has come to an end.

Some W3C standards activities related to Internet e-commerce include (apart from XML) Micropayments[32], JEPI (Protocol for negotiating payment methods on the Web)[33], Dsig

[29] http://www.w3.org/Consortium/Member/List

[30] http://www.w3.org/XML/Schema

[31] http://www.ebxml.org

[32] http://www.w3.org/ECommerce/Micropayments/

(Digital signatures initiative)[34], SDML (Signed Digital Markup Language), P3P (Platform for Privacy Preferences)[35], and ICE (Information and Content Exchange), [36] and the work of the Mobile Access Interest Group.[37]

7.2.2 General Business Document Standards Groups: The Organization for the Advancement of Structured Information Standards (OASIS)

OASIS[38] began life as 'SGML Open', a forum for vendors and consumers of SGML-related products. Today, its role has broadened to support the creation of interoperable industry specifications based on public standards such as XML. It is a consortium with over 140 member organizations across the globe. Its major activities are organised through the OASIS technical committees, of which there are currently 13. They are dealing with issues pertinent to e-commerce technology as it stands today:

- the Business Transactions Committee[39] is looking at the issues of managing transactions across long-running business activities over the Internet, which is widely acknowledged as a difficult problem to solve;
- the XML-Based Security Services[40] technical committee is developing the Security Assertion Markup Language.

OASIS is a champion for the ebXML initiative, although this is run as a separate entity. There are also crossovers with work being carried out under the W3C banner: for this reason, liaisons are actively maintained, with the hope of harmonising related initiatives.

7.2.3 Open Community Initiatives: BizTalk.org

Although initiated by Microsoft, BizTalk.org[41] is largely a vendor-neutral initiative aimed at promoting the use of XML in enterprise integration and particularly business-to-business document exchange. BizTalk.org hosts a library of XML definitions that have been published by the Biztalk community for general use in business-related e-commerce activities. Membership is free, as is use of the library itself. Members are able to extend the library by publishing their own XML 'products'.

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[33] http://www.w3.org/TR/NOTE-jepi

[34] http://www.w3.org/Signature/

[35] http://www.w3.org/P3P/

[36] http://www.w3.org/TR/NOTE-ice

[37] http://www.w3.org/2001/di/Mobile/

[38] http://www.oasis-open.org

[39] http://www.oasis-open.org/committees/business-transactions/index.shtml

[40] http://www.oasis-open.org/committees/security/index.shtml

[41] http://www.biztalk.org

Members are encouraged to explore related Microsoft products such as Biztalk Server 2000[42] but Biztalk library artefacts are not proprietary – they could be used with any XML - based e-commerce technologies.

Other vendors are also taking part in BizTalk. Fore example, cXML **(**Commercial XML**)** is a lightweight, BizTalk-compatible schema from the technology vendor Ariba[43].

7.2.4 Community of Interest Business Standards: EDI, OBI and RosettaNet

More closely-knit industry groupings will probably be most successful in the new world of XML based e-commerce. They will continue to band together into consortia and publish their own industry specific standards using XML as the general framework (preferably using XML schemas, now that standardisation is almost a reality). Some of these communities are considered below.

7.2.4.1 Electronic Data Interchange (EDI)

Existing business standards include EDI (Electronic Data Interchange) a pre-Internet collection of standard message formats that allow businesses to exchange data via any electronic service. The standards have been developed and administered by two significant bodies:

- UN /EDIFACT provide the defining international standards[44]; this initiative has gone forward under the umbrella of the United Nations Economic Commission for Europe (UN/ECE)and has provided standards that are now in use world-wide
- the Accredited Standards Committee (ASC) is responsible for ANSI X.12[45], which is dominant in the U.S. domestic market. Here, X.12 provides standards for business messaging across multiple industry sectors, which constitute the most widely implemented electronic data interchange (EDI) standards. They interact with a multitude of e-commerce technologies and are as the primary means of integrating electronic business applications.

Together, these standards are currently used by more than 500,000 businesses worldwide. The two groups have now joined forces however, with the goal of creating "the building blocks for a single set of accredited, international, cross-industry XML business standards. These business standards will be compliant with the developing ebXML technical framework, will be based on joint design rules and naming conventions, and will for the first time ensure that the standards used to trade nationally and internationally are the same."[46] This activity is known as "The Joint UN/EDIFACT & ASC X12 Core Component Development ". Its first meeting was held in Seattle in February 2001. This

[42] http://www.microsoft.com/biztalk/default.asp

[43] http://www.cxml.org/

[44] http://www.x12.org/x12org/international/

[45] http://www.x12.org/

[46] http://www.x12.org/x12org/international/index.html

process will lead to an e-business framework that seeks to leverage the benefits of EDI within the newer ebXML context (see section 6.3.3)

The XML/EDI Group[47] has undertaken to leverage the value of EDI by extending the framework with XML-based business rules and repositories. A European pilot project[48] was approved in June 1998[49].

7.2.4.2 Open Buying on the Internet (OBI)

OBI is a standard for B2B purchasing on the Internet, aimed at high-volume, low-cost-per-item transactions. It was developed by the OBI Consortium, founded in 1997. Development was partially underwritten by American Express and facilitated by SupplyWorks Inc. CommerceNet took over management of the OBI Consortium from SupplyWorks Inc in April 1998. Contributing organizations have included Microsoft, Netscape, and American Express. Membership consists largely of e-commerce technology and service vendors (e.g. Ariba and BEA), and a handful of influential financial institutions (American Express, Chase Manhattan Bank, VISA, MasterCard International).

The first version of the OBI specification[50] was published in May 1997. Version 3.0 of the standard is now developed[51] but this is currently accessible only to members.

The OBI architecture is strictly limited to the activities of four business entities: the requisitioner, the buying organisation, the selling organisation and the payment authority. In previous versions, OBI has used the X12 850 EDI standard for order formats, but has been updated to use XML.

Since version V2.1[52] OBI has included the UN EDIFACT version of the OBI Purchase Order for the international community in support of continuing globalisation efforts.

Membership of this particular community is not free: there are different classes, ranging from associate (US$5 000) to sponsor (US$50 000).

7.2.4.3 RosettaNet

RosettaNet[53] is a consortium dedicated to the development and deployment of standard electronic commerce interfaces to align the processes between IT supply chain partners (electronic component and semiconductor manufacturers) on a global basis. It is a significant initiative in several ways.

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[47] http://www.xmledi.com/

[48] http://www.cenorm.be/isss/workshop/ec/xmledi/isss-xml.html

[49] with no apparent published results, it is unclear what impact this pilot has had.

[50] [http://www.openbuy.org/obi/specs/obi-v1.rtf]

[51] http://www.openbuy.org/obi/specs/

[52] http://www.openbuy.org/obi/specs/OBIv210.pdf

[53] http://www.rosettanet.org/

Firstly it has gone beyond standardising document exchange formats, and also includes standardised business processes. In this regard it has already achieved for the semiconductor industry what ebXML wishes to do for the community-at-large.

Secondly, much has already been successfully implemented. In this regard it has gone further than many initiatives that have attempted to achieve less.

Finally, it is an influential initiative. Infrastructure initiatives such as ebXML and UDDI are keen for RosettaNet's explicit support. The response is pragmatic: standards and technologies are supported when they make sense to the consortium's trading partners. RosettaNet has published its support for ebXML messaging at the same time as trialling UDDI directory services; some RosettaNet documents are available through BizTalk.org. Technology vendors are also keen to attract RosettaNet participants: both Microsoft's BizTalk Server and BEA's Weblogic Collaborate offer 'add-ons' specifically tailored for them.

The RosettaNet framework actually includes 3 core elements, which allow trading partners to collaborate electronically:

1. The Partner Interface Processes (PIP ™) which define agreed trading partner business processes;
2. The RosettaNet Implementation Framework (RNIF ™) which defines transfer and security protocols to be used as well as the format of the RosettaNet business messages;
3. The Dictionaries, which define business documents and message formats.

Much of the success that RosettaNet enjoys is undoubtedly due to the nature of the industry and the experience of its participants in supply chain management, rather than anything specific about the new breed of XML technologies. The same standards and technology applied in another domain may fair less well. Standardising supply chain business processes, for example, may be a sensible goal in the global semiconductor industry, but may add little or negative value in a smaller, localised trading community where business processes are subject to frequent change.

7.2.5 International Trade, Finance and Banking

There are several noteworthy initiatives in the world of international trade, finance and banking, for example:

Bolero.net – an initiative by the banking and logistics industries, supported by seven of the top ten banks in the world, aimed at facilitating international trade on the Internet. For importers and exporters, the benefit is in providing support for e.g. customs processing. It is claimed that "processing time for trade documents could be cut from up to 25 days to just under 24 hours."[54]

[54] http://www.bolero.net/

Financial Information Exchange Protocol[55] – this is a messaging standard developed specifically for the real-time electronic exchange of securities transactions. The focus is on institutional business rather than retail applications.

Financial products Markup Language[56] - a protocol to support trading of financial derivatives. Its participants include technology vendors, banks, credit companies and trading organizations.[57]

FINXML[58] - a standard to allow financial institutions to exchange complex data relating to transactions in capital markets. FinXML claims compatibility with BizTalk, and CommerceOne's cXML.

Open Financial Exchange[59] - a specification for the exchange of financial data between financial institutions, business and consumers. CheckFree, Intuit and Microsoft founded the initiative in 1997. It was recently claimed[60] that more than 1000 financial institutions around the world have already implemented the Open Financial Exchange (OFX) specification, enabling the seamless exchange of financial information over the Internet.

Some technology vendors (e.g. Ariba and Commerce One) try to introduce their own incompatible de facto standards in the hope they will be widely adopted, although there is a tendency for them to become compatible[61]. However, there will always be sets of incompatible *standards* in use in B2B e-commerce.

Identrus[62] – not an XML messaging initiative, but a group established in 1999 by eight leading banks to provide the infrastructure for high-integrity, trusted financial transactions. The initial members included Bank of America Corp., The Chase Manhattan Corp. and Citigroup Inc. Financial institutions world-wide are now members, with recent additions including Westdeutsche Landesbank Girozentrale (WestLB, Germany) and Abbey National PLC (UK), and Wells Fargo & Company (United States).

The system, based on public-key infrastructure (PKI), gives financial institutions and corporate trading partners the ability to identify one another reliably during e-commerce transactions. The recent partnership between SWIFT and Identrus means that secure, non-repudiable messaging is provided as well as trusted identity. This will permit the service to be used for trusted third-party logging of critical financial messages. This would be used for example in conducting audits and in the event of disputes arising between trading partners.

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[55] http://www.fixprotocol.org

[56] http://www.fpml.org

[57] http://www.fpml.org/participants/index.html

[58] http://www.finxml.org

[59] http://www.ofx.net

[60] http://www.ofx.net/ofx/pr_rels.asp

[61] http://www.internetworld.com/print/1999/03/01/ecomm/19990301-procurement.html

[62] http://www.identrus.com

Successful adoption of Identrus services provides an environment in which the risk associated with higher-value transactions is considerably reduced, thus encouraging electronic trading for more substantial goods and services.

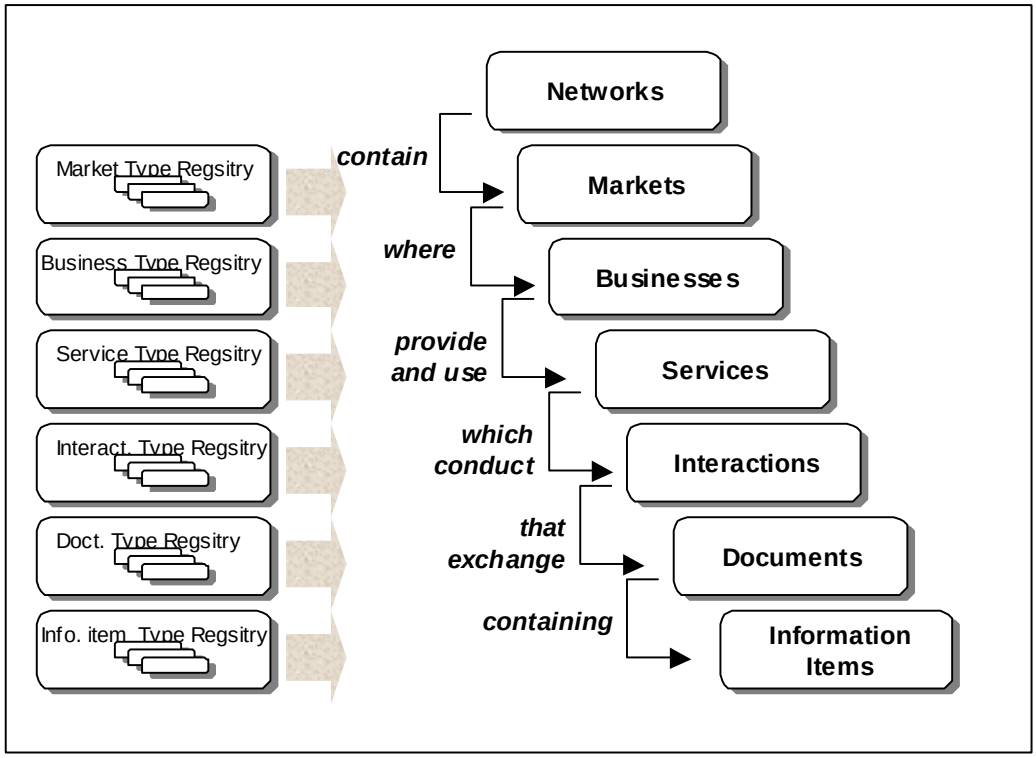
Microsoft is one of the technology vendors working to make several of its core products, including Windows 2000 and .NET servers, integrate readily with the Identrus infrastructure.

7.3 E-commerce Frameworks and Architectures

Several initiatives have been undertaken to provide a universal way of looking at all of the elements or 'building blocks' of e-commerce systems, and how they fit together. They differ in their scope, how they have evolved, and in the detail of how they are intended to be used. Ultimately they all share similar goals of improving interoperability of e-commerce technology by providing standard views of function, interfaces and architecture. Several of the most influential frameworks are presented below.

7.3.1 The eCO Framework

Created by CommerceNet[63] and sponsored by the U.S. National Institute of Standards and Technology (NIST) (and others), the Eco framework provides a comprehensive 7-layer model for describing concepts in e-commerce (see Figure 13).



[63] http://www.commerce.net/

Figure 13: The Eco Framework

It is related to the CBL/xCBL (Common Business Library), an extensible, public collection of XML-based document modules that companies can customise and assemble automatic business interactions on the Web[64]. Its purpose was to help businesses understand each other's e-commerce infrastructure and thus how they would interoperate. The project terminated in 1999.

7.3.2 The BizTalk Framework

The BizTalk[65] framework describes how BizTalk Documents are bundled up as Biztalk Messages and sent across Internet transfer protocols. The framework, depicted in Figure 14, contains the following elements:

- *Business Applications*, which communicate directly or via adapters with one or more
- *Biztalk Framework Compliant (BFC) servers*. The application sends the server a
- *Business Document* which is processed by the server to form a
- *Biztalk Document*, a SOAP message containing the Business Documents.

This is then sent across the Internet. The inverse process allows the recipient application to extract and process the content of the business document.

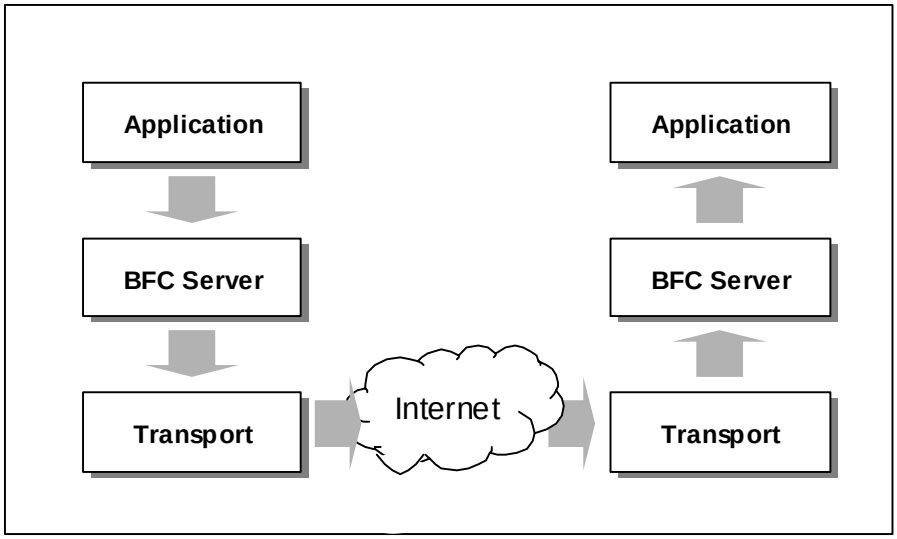


Figure 14: The essential s of the Biztalk framework

[64] http://www.commerceone.com/xml/standards.html

[65] http://www.biztalk.org

The Biztalk Framework is not as comprehensive as e.g. the EcO framework or ebXML, nor is it intended to be. It does not for example cover directory services, or standards for business processes.

7.3.3 Electronic Business XML (ebXML)

Sponsored by UN/CEFACT and OASIS, ebXML[66] has lofty goals. An initiative with just an 18-month lifespan (ending in mid-2001), it intends to develop a complete technical framework for describing just about every aspect of e-business. It has been stated that "a primary objective … is to lower the barrier of entry to e-business in order to facilitate trade, particularly with respect to SMEs and developing nations.[67]" With its work is complete, it is hoped that further work will be conducted under the banner of W3C.

The work builds substantially on the experience of EDI efforts.[68] The project has been conducted through teams dealing with different aspects of e-commerce systems. They are covering areas such as architecture; business process; registry and repository; transport, routing and packaging; and several others[69].

By March 2001, all ebXML specifications had been submitted for review. As the process of developing the specifications has progressed, software vendors have been eager to demonstrate prototypes and proof-of-concept demonstrators.

The ebXML specification process is just finalizing. Project participants approved the ebXML specifications on May 11th 2001. Evidence of commercial-strength ebXML-compliant technology[70] on the market is beginning to appear. Many of the most significant global e-commerce infrastructure vendors such as IBM, CommerceOne, BEA Systems and Netfish/Iona have collaborated to demonstrate ebXML compatibility, at least to the proof-of-concept stage[71]. Whilst Microsoft is a member of the ebXML initiative, it does not appear to have taken part in any such demonstrators.

When proven technology emerges designed to fit within the ebXML framework, it may go through a conformance testing process[72] to earn the label 'ebXML-compliant', using test suites provided by third-party, vendor-neutral organizations.

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[66] http://www.ebxml.org

[67] http://www.ebxml.org/geninfo.htm#about

[68] http://www.x12.org/x12org/international/index.html

[69] http://www.ebxml.org/project_teams/project_teams.htm

[70] Unless one counts SOAP technology as ebXML-compliant.

[71] http://www.ebxml.org/news/pr_20010404.htm

[72] see 'ebXML Technical Architecture Specification v1.04" http://www.ebxml.org/specdrafts/approved_specs.htm

7.3.4 Web Services with UDDI, SOAP and WSDL

Web services using SOAP, UDDI and WSDL are probably attracting more attention and generating more activity than any other 'framework' at the moment. They are still very young, but it is recognised that they have great potential: a W3C workshop on web services held in April 2001 attracted over 60 position papers from practically all of the major e-commerce integration technology vendors[73].

Universal Description, Discovery and Integration (UDDI)[74], the Simple Object Access Protocol (SOAP)[75] and Web Services description Language (WSDL)[76] are three complementary technologies that have been produced by vendors such as IBM and Microsoft (UDDI), Hewlett-Packard and Microsoft (SOAP), and Ariba, IBM and Microsoft (WSDL).

SOAP and WSDL are now draft submissions to W3C. SOAP is also being integrated into ebXML as part of the transport layer.

Together these technologies form an architecture that enables software services to be located and used over the World-Wide-Web. These 'Web Services' are provide in the following way (see Figure 15):

[73] http://www.w3.org/2001/03/WSWS-popa/

[74] http://www.uddi.org

[75] http://www.w3.org/TR/SOAP-attachments

[76] http://www.w3.org/TR/wsdl

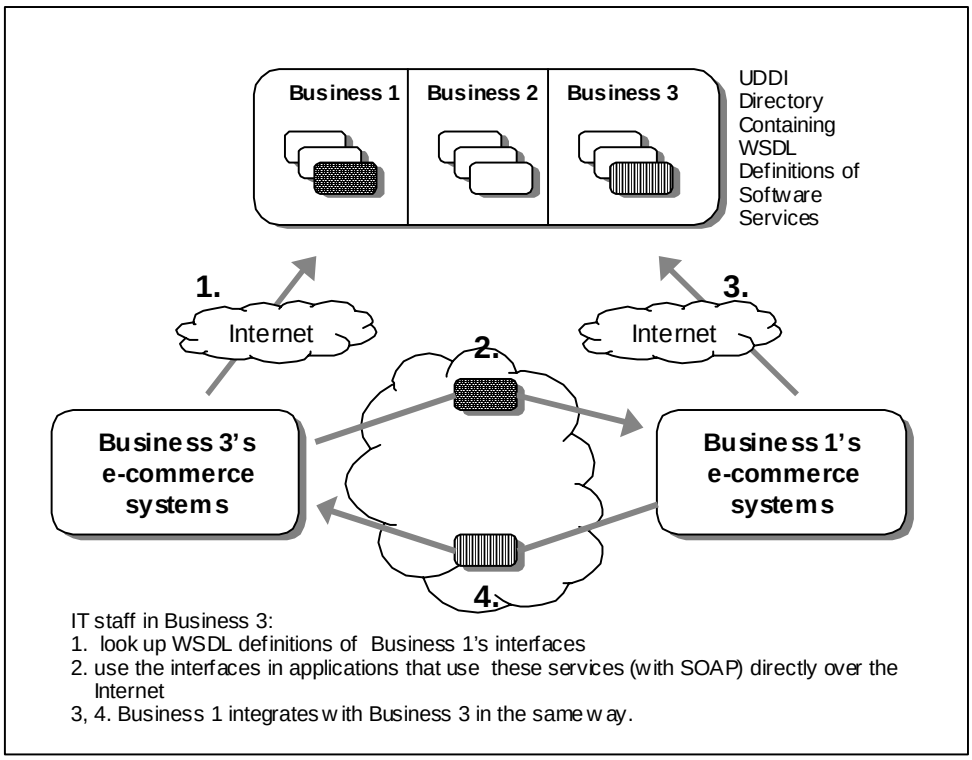

Figure 15: Web Services with SOAP, UDDI and WSDL

- The directory services of UDDI are used to discover internet-based business resources
- A WSDL description is retrieved from UDDI's directory. It describes how to use the software service interfaces of a registered business over the Internet
- The software systems of one business are then extended to use those of the other directly, according to the WSDL descriptions. The services are invoked over the World-Wide-Web using the SOAP protocol.

All of these elements have similar components specified in ebXML (which provides more besides).

As deployable technologies, these particular Web services technologies are further ahead than their ebXML counterparts. There are several commercially available SOAP development and deployment environments; IBM and Microsoft now collaborate to provide a UDDI service, each with its own site, mirroring each other[77].

Of the three elements, SOAP is the most mature and the most important. If a business knows whom its trading partners are and where to find them, and it knows how to invoke its partners' SOAP services, UDDI and WSDL aren't needed. Not surprisingly, there are

[77] http://www.uddi.microsoft.com and http://www.ibm.com/services/uddi

already fully deployed B2B e-commerce applications that have been constructed just using SOAP to integrate applications over the Internet[78].

As with XML and ebXML, SOAP leverages the experience of mature technologies that have gone before it: in this case, integration technologies such as CORBA and even IBM messaging have contributed greatly to the design of SOAP service interfaces.

These interfaces are then wrapped in XML and delivered as payloads across the Internet using widely used protocols like HTTP and e-mail. In relative terms, SOAP provides a cheap and simple integration technology that enables software applications to be coupled across the Internet. It needs relatively simple computing infrastructure. Using SOAP is still likely to need some programming effort – for the moment anyway - and there are still some technical issues to be addressed.

Nevertheless, SOAP has the potential to make fundamental changes in the way that e-commerce integration evolves. This is in part why it has been said, "In the truest sense of the phrase, SOAP is a disruptive technology[79]".

7.4 Electronic payment systems

In many respects, e-commerce systems are founded on electronic payment systems. Broadly defined, electronic payment is a financial exchange that takes place on-line between buyers and sellers. The content of this exchange is some form of digital financial instrument (credit card numbers, electronic cheques, or digital cash) that is backed by a bank of an intermediary or by a legal tender.

Incorporating electronic payment capabilities adds considerable complexity to IT systems. First, the security of payment systems must be sufficient to protect the IT applications. Second, the system must provide a high degree of integrity for transactions. It must ensure that communications between customer, merchant and financial institutions are secured from interception and alteration. Third, the system should enable payment by a variety of methods according to the customer wishes (e.g. direct debit, credit card, BPay, etc.).

In the case of cross-border trading, complexity is further compounded by additional needs, e.g. exchange rate calculations and compliance with legal and regulatory frameworks in one or both economies.

For Internet payments, a range of both conventional and specialised mechanisms exists. In the present form, conventional payment methods such as cash and cheques are not adequate for real-time payment interaction. Most Internet payment systems today use notational money like credit cards, purchase orders (a promise to pay later), and electronic fund transfers. Some innovative systems, such as various forms of electronic cash and micropayments, have had only limited success despite the technology being readily available.

[78] http://www.internetweek.com/indepth01/indepth041001.htm

[79] http://www.capeclear.com/clear_thinking.htm

7.4.1 Existing methods

Successful electronic payment mechanisms currently in use are:

- Credit cards (easily accessible; widely used on the Internet, however mostly in B2C e-commerce)
- Direct debit (direct regular payments from a bank account; rarely used for Internet transactions)
- Direct credit (direct payment into a bank account; rarely used on the Internet)
- EFTPOS (widely accepted for ad hoc payments from individuals; handles charge cards and credit cards; not very suitable for the Internet)
- Stored value cards (requires special equipment to credit and debit the card, hence currently in limited use on the Internet)
- Bill payment (allows payment using credit or debit cards from convenient outlets, e.g. government postal; service providers, home; works well with Internet payments)
- Interactive Voice Response (IVR) (a telephone based method that enables use of phone keypad to navigate through a menu prompted by a computer generated voice response; integration with Web phones is under development.)
- Direct payment links (regular, high volume payments from a large customer base; uses third party Internet-based systems making direct access to the merchant or agency)
- Real time gross settlement (RTGS) (immediate transfer of very high value payments; accessible via IVR, Internet and handheld terminals)

The three key factors for choosing a particular payment technology are availability, initial set-up costs and trust. Customers frequently use telephone-based payment methods. They are easily accessible, low cost and have a high level of trust. The Internet by comparison has less penetration and higher costs but this is changing as more users take up the Internet for other purposes. The level of security and trust is also improving with Internet-based protocols (e.g. SSL) and systems (e.g. PKI systems).

7.4.2 Current Trends

The issues related to present and future payment methods remain complex. Novel financial instruments have experienced limited success to date. For B2B e-commerce, these forms of financial instruments need to be further developed.

All such instruments include the notion of an electronic token capable of supporting large and small financial transactions. The tokens themselves can be backed by a number of means: cash, credit, electronic bill payments (prearranged and spontaneous), bank cheques, letters of credits, or wire transfers.

Some of the key issues to consider are:

- How electronic tokens vary in their protection of transaction privacy and confidentiality
- How to maintain financial transaction records for all the parties involved
- Costs and benefits to all stakeholders - buyers and sellers; financial institutions; governments as leviers of taxes and tariffs; law enforcement agencies.

Some of the recent trends in both the established and the emerging electronic payment technologies are:

- *Smartcards* (stored value cards with an additional built-in computing capability; can store digital signatures, fingerprints, etc.; can be programmed to work on multiple applications). This type of technology has been successful where implemented. It will gain greater impact and significance once card readers are widely and cheaply available. The inclusion of smart card readers as part of personal computer packages by hardware manufacturers for authentication purposes will accelerate their use on the Internet.
- *Credit card payment with Secured Socket Layer (SSL) and Transport Layer Security (TLS)*. These protocols enable secure transmission of Internet messages between two parties. They handle authentication and encryption well and are built into popular web browsers and operating systems. They are widely used for Internet shopping with credit cards, enabling business sites to be trusted by its customers and partners.

  Credit cards will remain a major e-commerce payment method. However, in emerging Internet economies credit cards do not currently have the penetration to make it a pervasive means of payment. In China for example, over 150 million credit cards had been issued by late 2000, but the infrastructure was not in place to permit their use widely in web-based transactions[80].
- *Secured Electronic Transaction (SET)* is a protocol designed for accepting credit card payments over the Internet. This technology has seen a disappointing rate of adoption around the world. Uptake has been minimal in the U.S. and limited in Europe. MasterCard maintains a list of SET adopters.[81]

  SET does provides several advantages over other methods, in theory[82]:

  - use of X.590 digital certificates, providing a hierarchy of trust
  - multi-party transactions (in comparison to e.g. SSL)
  - limited access to the cardholder's credit card: the merchant never sees the consumer's credit card details. Thus, SET transactions are more secure than the current mechanisms of transmitting credit card details over the Internet, or even giving the card details to the merchant in person.

[80] http://www.acca21.edu.cn/eng/2000/08/18.html

[81] http://www.mastercard.com/shoponline/set/bycountry.html

[82] as discussed at: http://www.sans.org/infosecFAQ/covertchannels/SET.htm

Some of SET's drawbacks, which seem to be dominant factors, include:

- Transactions are slow and the transaction process is relatively complex, involving several parties (cardholder, the merchant, the cardholder's bank, the merchant's bank, and the credit card provider)
- Complex infrastructure requirements (Certificate Authorities, acquirers, e-wallets) which also give rise to increased costs, as well contributing to processing time for the transaction approval
- Insufficient benefit to the financial institutions to push for widespread adoption.

- *Financial EDI* (a process to transfer payments between accounts through the generation of payment requests to financial institutions; based on X12 or EDIFACT messaging standards; integration with XML).
- *Electronic cash* schemes (encrypted data representing a 'coin' authorised by a bank; treated like cash) have in general encountered a slow uptake[83]. E-cash involves establishing a stored value account (an e-wallet) containing digital 'money', which can then be spent in transactions with seller sites that offer a reciprocal service. There are several benefits to the purchaser:
  - Anonymity is restored – as with a cash transaction none of the buyer's details are acquired by the seller;
  - Improved security – as most e-cash systems use password protection, theft of an account number alone is unlikely to result in fraudulent use of the resource

  Despite these advantages, merchant sites have been slow to adopt the technology, which is keeping the level of penetration low. Also, as consumers become more confident using credit cards over the Internet, the need for alternative technologies, despite their advantages, becomes less pressing. As a result companies such as IBM have halted development and promotion of their e-wallet technology[84].

  One of the major concerns with electronic cash however is its use for illegal purposes, especially money-laundering. The anonymity that it brings – of legitimate value to a buyer wishing to protect their identity – translates to an absence of traceability in electronic money-flows.
- *Micropayments* (pre-purchased credits that can be deducted in small increments; uses electronic wallet technology) have an uncertain future. For example, Cybercash was an electronic wallet scheme enabling micropayments. It worked by linking a customer to a particular machine containing the wallet and proprietary software; actual payment method could be credit card, digital coins or direct debit.

  Cybercash was one of the pioneers in the field of micropayments systems, but the company filed for bankruptcy protection early in 2000. Their fate exemplifies some of the difficulties faced by proponents of micro-payments technology:

[83] http://www.cnn.com/2001/TECH/computing/01/02/credit.card.alternatives.idg/index.html

[84] http://news.cnet.com/news/0-1007-200-5903227.html?tag=owv

- Consumers don't seem to like the system: the trouble of going to pay for something which is of low value in the first place seems to outweigh the benefits[85]
- Credit card companies may not accept transactions for small amounts as they make too little profit from them;
- Direct debit methods – where e.g. money is directly transferred from a check account – are considered high-risk, as they are more open to fraud.

There have been some successful applications of micropayments however. In Japan, NTT's DoCoMo offers thousands of Internet services on its Web-enabled cell phones. Its subscribers are now numbered in millions, who are all prepared to pay $US 0.80 - 2.50 for each service use.

7.5 Electronic procurement

The Internet has changed procurement forever by allowing companies to connect employees and suppliers globally. This makes it possible to streamline and automate purchasing across departments, business units, divisions and continents. Internet applications enable organisations to dramatically reduce purchasing cycle times and transaction costs as information can be processed and accessed on-line from anywhere in the world. There are now many reported instances of such benefits: for example,[86] that an integrated purchasing application can reduce purchasing order cycle times by 50 percent or more, and the cost can be reduced by $10 to $15 per order.

Such benefits were available previously through EDI solutions but implementation costs were high. Small suppliers may have had no choice but to implement EDI if powerful buyers insisted on it, but in reality only the large organizations could absorb costs and gain real advantage.

Despite the reduced costs and global accessibility of Internet, there are still challenges to small companies when using the Internet as a supplier in global electronic procurement. The multinational companies they wish to supply have procurement systems that span different economies and cultures. This causes problems for both the supplier and the multinational. Each location can have different currencies to support, diverse languages and complex tax requirements for certain items and purchases. There may be multiple systems to support in each location, contributing to higher maintenance costs and the inability to capture global spend data in a single system.

[85] http://www.businessweek.com/technology/content/apr2001/tc20010423_871.htm

[86] in the AMR Research report on Electronic Procurement, October 1998.

7.5.1 E-procurement systems and technologies

E-procurement systems can be considered as specialised instances of e-commerce systems. From an integration perspective, they contain all of the elements of business systems tailored to an organisation's buying and selling needs. A solution for a particular enterprise will typically support:

- *Business processes* that covers all of its procurement needs, from product searching to payment
- *Business dictionaries* that enable a common data model to be used for communication and collaboration across the supply chain
- *Message mapping and adapters* for integration with any number of existing applications and especially ERP systems, both internal and external
- *Analysis and planning tools* for examining e.g. performance, cots and logistics
- *Seamless interoperability* with other Internet-based global trading hubs and exchanges

Such systems may be home-grown, but an increasing number of vendors are now offering highly customisable, off-the-shelf solutions. IBM, Ariba, Oracle, SAP, i2 and CommerceOne are a few of the most prominent. Due to the growth of e-business industry, most ERP vendors appear to have solutions for e-procurement.

7.6 Security technology and Infrastructure

As discussed in the previous section, security must be considered carefully when designing and building Internet-based systems. An organisation must have a security policy, appropriate security mechanisms to its computer systems and monitoring and auditing mechanisms to observe the system in operation. Security concerns can be divided into concerns about access control, and concerns about information and transaction security.

Access control mechanisms such as passwords, encrypted smart cards, biometrics and firewalls ensure that only valid users and applications get access to information resources such as user accounts, files and databases. Information and transaction security schemes such as secret key encryption and public key encryption are used to ensure the privacy, integrity and confidentiality of business transactions and messages. These schemes are the basis of several electronic payment and procurement systems.

There are a number of practical measures that can dramatically improve the security concerns. Firewalls and proxy servers can block unwelcome attempts to access the internal systems. Strong authentication mechanisms provide system access only to employees and other legitimate users. Access control mechanisms grant users rights to access only the resources and applications they need to do their job. Careful planning, implementation and administration of a secure network can reduce the risks of unwanted attacks. Defending against the unknown attacks is impossible, but the risk can be mitigated with good system design.

Cryptography is based on a set of mathematical techniques that transforms digital information from one format to another depending on the value of a number, known as the encryption key. This produces a scrambled version of the message that the recipient can then decrypt, by using either the original key (symmetric encryption) or a different, but related, key (asymmetric encryption). The latter one is more practical and known as *public key cryptography*, involving a pair of keys, one private and one public. Information encrypted using the public key can only be retrieved using the complementary private key (see Figure 16). In addition to encryption, these keys can also be used to create and verify 'digital signatures'. These can be appended to messages to authenticate the message and the sender.

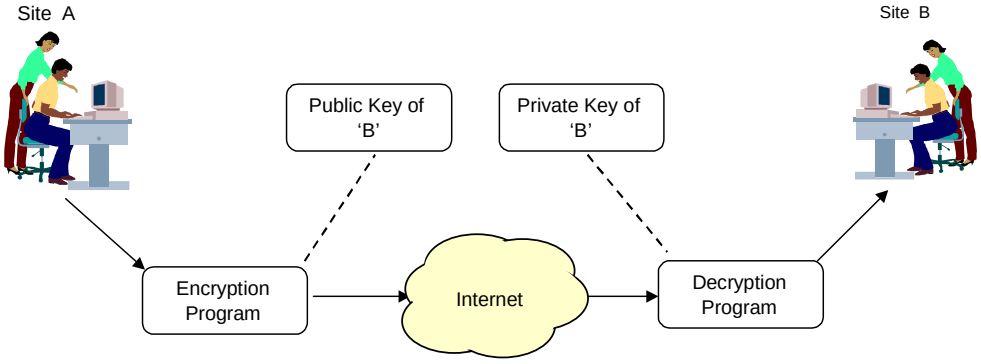

Figure 16: Use of asymmetric key encryption to send messages

In order to enable secured and trusted transactions for B2B e-commerce, an organisation might need a robust *public key infrastructure* (PKI) in place. This should provide a framework for technologies to generate, store and manage keys and digital certificates, security policies for cryptographic systems used, and procedures to create and manage this infrastructure.

7.6.1 Market drivers for PKI

Business processes conducted with partners, customers, suppliers and contractors over the Internet need strong infrastructure to build trust and highly secured systems. The only authentication system that can meet the requirements for supply chain integration and enable B2B e-commerce is digital certificates and signatures, delivered by PKI solutions and services. PKI mitigates these risks to a great extent.

Some key market drivers are:

- Security for B2B e-commerce applications
- Large-scale VPNs
- Secure e-mail
- Move of strategic applications to Web-based environment

Despite beliefs that PKI is not easy to use, configure and maintain and not easy to sell to executives, most businesses are convinced that there are no viable alternatives, and hence, they must move forward to support B2B e-commerce objectives of their organizations. No doubt, the success of PKI will have a major impact on organization's core business operations.

PKI digital certificates and systems can be acquired from a wide variety of sources:

- Banks, financial institutions, government agencies, telecommunication providers, legal associations, etc.;
- Integration and professional service suppliers;
- Product technology suppliers;
- Digital certificate and ISP managed service providers;
- Best-in-class PKI vendors.

Digital certificate solutions work out-of-the-box with popular Web browsers, e-mail client-software applications, VPNs, SCM platforms, ERP systems, mainframes, AS/400 servers, and most operating systems. B2B e-commerce infrastructure provider, Ariba partners with RSA Data Security to use RSA solutions from Secure Sockets Layer (SSL) protocol to digital certificates. SAP solutions integrate well with third-party security products, based on digital signatures and digital envelopes.

The advances in Certificate Authorities (CAs), Registration Authorities (RAs), LDAP directory-enabled certificates, and improvements to the popular Web browsers and e-mail clients are lowering the startup and maintenance costs for PKI systems. The early performance problems that the PKI systems suffered are now being improved.

7.6.2 Integration issues related to PKI

The PKI solution needs to be integrated properly with the IT systems of all partners in the supply chain. Some important issues to be considered here are:

- The scalability of the PKI system with the growth of the organisation and its partners network.
- Standards that make encryption feasible have to be established within an organisation and its trading partners.
- Simple user interfaces to use encryption.
- Easy management of encryption software and certification process.

PKI vendors (e.g. Entrust, Baltimore, RSA Security, VeriSign, Xcert, etc.) have made big strides towards simplifying the process of user administration and enrolment as well as the process of setup and rollout. Deploying an in-house PKI solution is still an expensive, time-consuming proposition for many organisations. Outsourced solutions can relieve some of the discomfort, but trying to convince management, users and trading partners that security should be traded for ease of deployment is a tough decision for the enterprise.

Interoperability is still a hurdle for the complete acceptance of PKI based security solutions.[87] Standards compliance alone is insufficient to guarantee multi-vendor interoperability. Even the simplest protocols sometimes require additional clarification. PKI customers are demanding interoperable solutions and are expecting vendors to resolve the interoperability issues. PKI Forum fosters multi-vendor cooperation and information exchange in order to resolve the problem of interoperability. Interoperability baseline should be based on reasonably stable IETF PKIX standards.

Software-based cryptography implementations are prone to tampering or misuse, hence hardware cryptographic modules must be used for certificate signing. It is vital to source a PKI that is completely open and built to the X.509 standards. One of the design goals in X.509v3 is to add CA cross-certification. The IETF has included CA cross-certification in the Certificate Management Protocol (RFC 2510). There has not been many demonstration of interoperability of cross-certificate request and cross-certificate response from RFC 2510.[88] Though CA cross-certification appears to be a barrier to create a powerful PKI, the establishment of appropriate agreements as to risk-management practices and business terms and conditions between the cross-certifying organizations will help in developing a communal approach to PKI practices.

The Asia-Pacific Economic Cooperation (APEC)[89] organisation, established in 1989, has since become the primary regional vehicle for promoting open trade and practical economic cooperation among Asia-Pacific economies. APEC encourages facilitation, including cross-recognition of standards where these are of trade significance in a particular sector. Further work on trade facilitation measures such as standards and conformance will promote electronic authentication technologies for developing mutual trust for B2B e-commerce. APEC TEL has an active e-SecurityTask Group[90] that disseminates useful information about international trends in respect to public key authentication. For example, the issues related to Certification Authority business models, the responsibilities of all trading partners, types of key generation, security of private and public keys, and liability of Certification Authorities are discussed in one of the group's position papers.[91]

When integrating security subsystems with existing applications and communication layers, proper application programming interfaces (APIs) need to be defined before integration can commence. Message formats must also be defined. Though message standards such as EDIFACT and XML take care of this definition, system integrators still need to be aware of optional and discretionary fields to use them in a uniform way. Decisions made here will be sensitive to interoperability. Security architects must complement digital certificate systems with back-end authorization systems or look for

[87] http://www.zdnet.com/pcweek/stories/news/0,4153,2412887,00.html

[88] http://www.networkcomputing.com/1108/1108colmoskowitz.html

[89] http://www.apecsec.org.sg/

[90] http://www.apectelwg.org/apec/atwg/preatg.html

[91] http://www.apectelwg.org/apecdata/telwg/eaTG/pki.html

PKI vendors that can provide integrated attribute-based certificate servers. Scarcity of technical expertise in PKI technologies could also be seen as an inhibitor.

Private sector issuers of keys will be encouraged to develop responsible practices such as key backup for data recovery purposes. Keys can becomes lost or corrupted. Also, imagine a disgruntled employee encrypting all the data on his or her desktop and then destroying the private key, making all such information unrecoverable. There should be a strong business case for employers to implement mandatory key backup policies.

8 Issues & Challenges

There are many challenges that must be overcome in order to integrate businesses over the Internet successfully. The barriers and inhibitors are summarised below; the needs that they reveal are then further discussed, where appropriate, with respect to SMEs and international trade.

8.1 Barriers and Inhibitors

The framework in which these issues are examined is derived from two sources: the report "Barriers to Electronic Commerce" from CommerceNet[92]; the "Deadly Sins" that AOEMA[93] have reported as inhibitors to e-commerce within the APEC region.

The CommerceNet report is significant in several ways. For example, over 80% of the 1500 respondents were based outside of the US, largely from Asian economies. The results from non-US respondents are therefore useful indicators of issues in several APEC economies. Two significant categories are 'B2B Barriers: Top-10 Non-US' and 'SME Barriers: Top 10 non-US". They are listed below in priority order.

The "Deadly Sins" are significant because they are supported by the substantial experience of AOEMA in dealing with the practical issues faced by businesses in the APEC region relating to 'paperless trading' and electronic commerce. They are listed below, for comparison with the CommerceNet findings.

B2B Barriers: Top 10 Non-US	SME Barriers: Top 10 Non-US	AOEMA's "Deadly Sins"
1. Organisation	1. Lack of qualified personnel	Language
2. Culture	2. Lack of business models	Security of on-line transactions
3. International trade barriers	3. Fraud and risk of loss	Lack of knowledge and skills
4. User authentication and lack of PKI	4. Legal issues	High cost
5. Legal Issues	5. Not sure of benefit	Inadequate telecommunications infrastructure
6. Lack of qualified personnel	6. Partner e-commerce readiness	Uncertainty about legal, regulatory, taxation, consumer protection issues
7. Lack of standards	7. Customers can't find me	Financial transactions
8. Inconsistent tax laws	8. Inconsistent tax laws	
9. Executive awareness	9. Proprietary technology	

[92] Available at: http://www.commerce.net/research/barriers-inhibitors/2000/Barriers2000study.html

[93] http://www.aoema.org

10. Legal environment	10. Vertical Markets	

The key issues can be summarised as follows:

Uncertainty about business models and how business entities organise for e-commerce is a major concern. Although not present directly in AOEMA's findings, these issues may be considered to be 'everywhere and nowhere', and are implicit in several of the concerns identified. The current backdrop of failing 'dotcoms' around the world, and waning confidence in the Internet, further highlights these concerns.

Lack of skills, security issues and legal issues are ubiquitous and high-priority. Although not indicated in the findings above, the difficulties faced here are in all cases amplified by the needs and constraints of cross-border trading.

Lack of basic technology for interoperability does not appear to be a first-order issue, as long as adequate telecommunications infrastructure is in place. It is still perceived however that standards aren't doing enough; proprietary technology is still a major concern.

Language and Culture are critical issues especially for non-Western economies wishing to gain global penetration. Problems exist here for both B2C and B2B trading.

In the following sections we will discuss the issues that the above barriers and inhibitors reveal.

8.2 Uncertain Business Models

Whilst many enterprises recognise the benefits of reaching beyond their doors and connecting to outside organizations, understanding how and when to 'get online' has become a different proposition after the global downturn in the Internet economy. Little more than a year ago, the mood was one of unfettered optimism. Now businesses with prior experience are cautious, whereas newcomers may be sceptical and confused by the conflicting indicators of the potential for e-commerce. It has never been more important to couple the brave new world of technical innovation with old-fashioned business planning.

First, some of the global trends in e-business are examined below. This is followed by an examination of the issues that need to be addressed by e-commerce adopters.

8.2.1 Global Trends

Economic forecasts continue to predict huge growth in traded e-commerce value over the coming years, yet there are daily accounts of more companies closing their doors, or whole economies facing a downturn due to massive failures within their Internet-based IT sector. This picture is true of both B2B and B2C trading, though in different ways.

It is still expected that global B2B trading will account for the lion's share of e-commerce: its value is expected to lie within the band US$2 trillion to about US$10 trillion by 2004[94]. This is despite significant failures already evident within B2B economies worldwide. For example, the initial rush to establish innovative, independent B2B marketplaces has already subsided.

Many such e-ventures have already closed their doors. Virtual marketplaces were often overcrowded, and business-cases were weak. Meanwhile, many of the more established trading communities are thriving within an e-commerce context. Closing ranks around vertical marketplaces, their B2B trading is often creating value by reducing costs in well-understood supply chains rather than inventing new businesses[95].

Although only a fraction of the total B2B trade, the value of B2C trade is also expected to grow substantially with predictions in the range US$0.2 billion to US$2 billion by 2004[96]. Yet in stark contrast, Nasdaq companies lost an estimated $US4 trillion in value in the last year[97]: similar stories can be told for even the strongest economies within the Asia-Pacific region.

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[94] http://www.emarketer.com/ereports/ecommerce_b2b/welcome.html

[95] B2B E-Commerce: Where is the Value? http://www.buildings.com/Archive/b2bwhereisthevalue.asp

[96] http://www.emarketer.com/ereports/ecommerce_b2b/welcome.html

[97] "Dotcom beggars ask users for help" Australian IT section, April 10th 2001

8.2.2 Regional Trends

Seen in finer resolution, the picture varies substantially within regional economies.

8.2.2.1 North America

North American business-to-business (B2B) e-commerce spending is reported to have reached US$255 billion in 2000, or 59 percent of the $433 billion spent worldwide[98].

In the **US**, overall commitment to e-business is high. Within organizations recently surveyed[99], 96% claimed to be "committed to e-business" compared to 80% in 1999. In specific areas of e-business, the steepest growth was in 'one-to-one' B2B applications, where one business targets another specifically. Here, 20% of businesses claimed to be active in 2000, compared to only 10% in 1999. Surprisingly, the number reporting development of supply chain integration dropped one point, down from 8% to 7%.

Canada is expected to show strong B2B growth. By 2005, Canada's B2B market will reach $1.03 trillion[100]. The automotive and petrochemical industries will be particularly dominant elements of B2B trade. Leading the charge to trade online will be Ontario and Quebec, which will account for 71 percent, or $129 billion, of Canada's B2B e-commerce by 2005.

British Columbia and Alberta will account for an additional 21 percent of the total, leaving just eight percent generated by Canada's remaining six provinces and three territories.

8.2.2.2 Asia-Pacific

In the year 2000, the **Asia-Pacific** region captured 22 percent ($96.8 billion) of the worldwide total B2B spending. This figure is expected to grow to 24 percent in 2001, as the global dominance of the US wanes[101]. This trend is also reflected in numbers of Internet users, where for the first time, more than half (57%) are reported to be outside the US[102], with Asia accounting for the most vigorous growth elsewhere:

Economy	% households with Internet access
Hong Kong	49.5%
Singapore	48.4%

[98] Study: North American B2B Dominance to Diminish http://www.ecommercetimes.com/perl/story/?id=8623

[99] Are Corporations Moving To E-Business, http://www.cutter.com

[100] Canada's B2B Future, http://www.forrester.com/ER/Research/Report/Excerpt/0,1338,10942,00.html

[101] Study: North American B2B Dominance to Diminish http://www.ecommercetimes.com/perl/story/?id=8623

[102] Most internet users are now outside the US http://www.ecommercetoday.com.au/ecom/au_art/a13023_02.htm

Korea	45.5%
Chinese Taipei	42.9%
Australia	40.0%
New Zealand	39.9%
Japan	24.1%
Source: Nielsen//NetRatings Global Internet Index	

It has been reported[103] that B2B transactions are expected to account for substantial growth of e-commerce in the Asian Pacific region, with the traded value to climb from $39.4 billion in 2000 to more than $338 billion in 2004.

This overall growth will be fuelled by economies where e-commerce spending is already high as well as astonishing rates of expansion in others:

Japan alone accounts for nearly 70% of the regional e-commerce traded value in 2000.[104]

Hong Kong 's e-commerce trade is expected to grow about 15-fold from approximately $670 million to $10 billion;

China's Internet penetration rate is low (0.9 %) but e-commerce trade is expected to grow about 30-fold from approximately $800 million to $24 billion;

India's Internet penetration rate is very low (0.3 %) but e-commerce trade is expected to account for the largest gain in Asia with growing about 50 - fold from about $120 million in 2000 to $6 billion in 2004.

However, elsewhere in the Asia-Pacific region, uptake is marginal, and is likely to remain lower than in neighbouring economies. As the gap widens between whole economies, trading communities and geographic regions, the phenomenon of the 'digital divide' portrays a picture of more sharply fragmented economies. The social and economic consequences are being addressed in a variety of national and international arenas[105].

8.2.3 Business Models: New and Old

In the Internet-based scenario, business information, customer service and time to market are becoming increasingly important as they create new opportunities and delivery channels. Companies need to reconcile their various supply chain management and enterprise resource planning projects by combining their business objectives, organisational relationships and technical requirements within a single business strategy.

It may be taken for granted that new business models are required to be competitive in the Internet economy. Too much innovation may not however be a good thing:

[103] http://www.emarketer.com

[104] Study: Japan Boasts 70 Percent of Asian E-Commerce http://www.ecommercetimes.com/perl/story/7352.html

[105] see for example the OECD efforts as described at http://www.oecd.org/media/release/dotforce1801.htm

8.2.3.1 E-Marketplaces

"The typical independent eMarket is struggling, and ... only a relatively small number of them are likely to survive in the market maker role."[106]

The main issue is that the independent e-markets face competition from more focussed industry consortia organising around their own vertically integrated markets. Ironically, some of the most solid successes in B2B e-commerce have emerged where traditional, existing business models and supply-chains have adopted e-commerce strategies. Here, e-commerce technologies have the potential to create valuable efficiencies in cost and time. This has been the case in several global industries, e.g. semiconductor manufacturing, automotive components and now travel. Moreover, by automating the collection and analysis of more business information, e-commerce enables new and optimised services to be offered in ways that were not previously possible[107].

Both types of e-marketplaces continue to emerge however, with recent participants including:

Malaysia: Microsoft has signed a memorandum of understanding with Tradenex.com to develop a supply-chain hub for the retail sector, called Malaysian Retail Exchange[108]

China: The Chinese construction industry has launched a B2B building materials site for the Chinese construction industry; the aim is to provide an online marketplace for construction industry wholesalers and end users[109].

ChinaEB's 'horizontal' e-marketplace[110] covers a broad range of industries such as construction, automotive, energy, and mining.

Chinese Taipei: The Industrial Development Bureau (IDB), a central government agency, is launching the Taiwan Industrial Marketplace, a cross-industry portal designed to standardize and integrate more than 20 domestic and 30 international e-marketplaces[111].

8.2.3.2 The Need for a Business Case

Put simply, having a solid business case and business model are paramount. These are not necessarily evident in the 'horizontal' e-marketplace model: this brings together many suppliers and many potential buyers, but has to assume that some alchemy will occur that allows the participants to find the business model that will suit all parties. In its most

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[106] B2B eMarket Survey: Summary of Findings, Accenture Institute for Strategic Change: http://www.commerce.net/research/barriers-inhibitors/2k1/R2k1.06AccentureB2BeMtSurv.pdf

[107] http://www.buildings.com/Archive/b2bwhereisthevalue.asp

[108] reported March 7th 2001, http://www.asia.internet.com/ecommerce

[109] reported March 8th 2001, http://www.asia.internet.com/ecommerce

[110] http://www.chinaeb.com

[111] reported March 14th 2001, http://www.asia.internet.com/ecommerce

opportunistic form it is like 'panning for gold' in that the likelihood of success is low; but when successful, the potential returns may be high.

Understanding success factors across the whole supply chain is equally important, if far more difficult to achieve. In this context it is important to consider the viability of the entire global 'virtual village' or trading community rather than purely local factors within a single economy.

8.2.4 Organisational Challenges: Supply-chain Innovation

Companies as individual entities and in the context of whole supply-chains must be flexible enough to 'organise for success' around new business models. Consideration must be given to the way in which group and individual roles are defined to support e-commerce activities. This will involve change within individual organizations but should not forget to consider the entire supply-chain.

In that context, possibilities to be considered include introduction of intermediaries. An existing supply-chain may be enhanced by the introduction of a new, 3rd-party providing for example an electronic trading hub. This may require the hub operator to organise the supply-side as a loose federation of independent suppliers who then realise efficiencies of more centralised co-ordination and planning, including more timely access to a larger number of markets. The Granada Research Report has "defined the characteristics of industries in which intermediation can be an attractive business proposition, for example, where there is a highly diversified customer base" [112]. Other advantages cited include:

- Managing the complexity of many-to-many relationships;
- Providing availability of product and/or service on a local basis;
- Providing customer support and service over the lifetime of the customer's usage of the product/service on a local basis;
- Maintaining a level of quality of final good or service;
- Providing competitive pricing for good and/or service, given the four above-mentioned value-added services.

In Australia, Freshport[113] is an example of one such hub operated on behalf of parts of the horticultural industry[114].

8.3 Lack of Skilled Resources

Despite the real benefits offered by "off-the-shelf" integration solutions, such technology will never be able to cater for all business and technology situations. They may provide so-called "90% solutions", but large-scale integration still requires considerable expertise.

[112] http://www.commerce.net/research/ebusiness-strategies/2000/00_02_r.html

[113] http://www.freshport.com.au

[114] http://www.cmis.csiro.au/Phil.McCrea/presentations/interact99/paper/interact%20paper.htm

Experienced systems integrators and system architects will remain highly sought after and command high salaries, despite some general downward trends in the IT sector globally. There are many other associated roles that also demand skilled professionals: software developers, project managers, testers, and technology-specific 'gurus'.

However, many of the new tools and technologies assist less skilled personnel complete what are really quite complex integration tasks. Business workflow design and automation tools are in this category. Their goal is to allow business personnel, rather than technical personnel, to design business workflows, and then automate the integration of the systems that will execute them. In turn the tasks that these tools undertake are aided by the flexibility of the new deployment technologies that emerge:

"Just as the Web server created a new less skilled design center, populated by the 'Webmaster' … The SOAP-based XML Web service will create a new less skilled design center. Business processes will be published, customized and integrated by what we term a 'Bizmaster' … The balance of power will shift from skilled systems developers to the new class of 'Bizmaster'[115] ".

For small enterprises, where costs may already threaten high-quality Internet facilities, high salaries may push professional services out of the picture altogether. The Southeast Asia Regional Computer Confederation has reported that Internet and e-commerce technical skills are amongst the shortest in supply in the region, as well as non-technical skills in complementary disciplines such as marketing, change management and strategic planning[116].

Small enterprises are also more sensitive to shortcomings affecting skills across the IT industry:

- Lack of training: Transfer of knowledge is lacking. New staff cannot handle the complexity of integrated systems at the enterprise level.
- Short supply of money: if the cost of integration and the return on investment are not clear, there will be a natural reluctance to hire skilled staff.
- Help desks and support: Cost-effective help desk functionality is not available.

[115] http://www.capeclear.com/clear_thinking.shtml

[116] http://english.sohu.com/20001129/file/0887,250,100031.html

8.4 Security Issues

Security technology that now exists can be used to provide at least adequate levels of protection. Companies will increasingly look similar in terms of the basic security technologies they adopt. The key differentiators will appear in terms of the policies they develop and how well employees adhere to them. For example, the protection offered by elaborate firewalls is worth little if users can dial-in to a modem attached to a system within the protective barrier (see Figure 17). They will then be connected to the private network with full privileges and access rights. Dial-in access has to be well protected with secure authentication mechanisms, and users have to adopt practices that reinforce security measures.

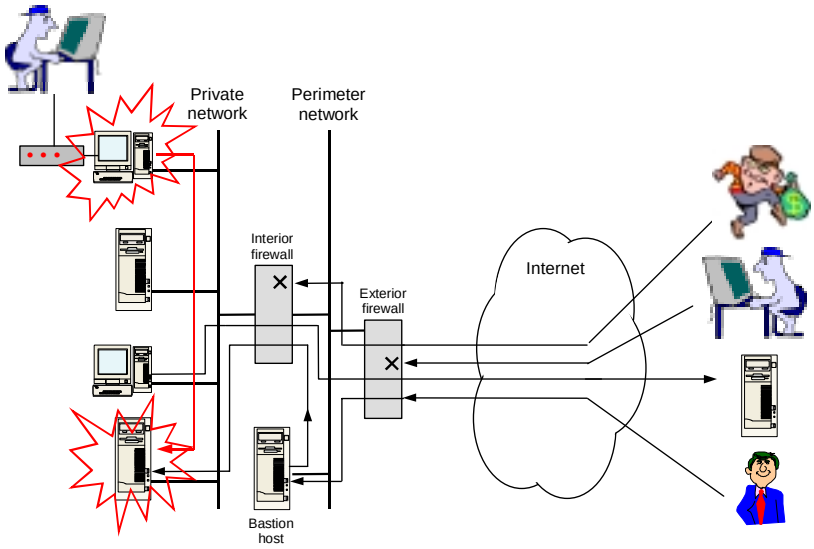

Figure 17: Using modems to bypass defensive barriers

It is equally important to realise that no security system is completely impenetrable. Businesses need to understand the threats they are exposed to and their likely consequences (financial, commercial, legal etc.) as managed risks (see Figure 18). This will also assist in adopting appropriate policies and acquiring suitable technology infrastructure. Also, companies are increasingly able to find suitable and affordable insurance against the risks they are exposed to through electronic trading[117].

[117] see e.g. http://finance.smartpros.com/x24966.xml

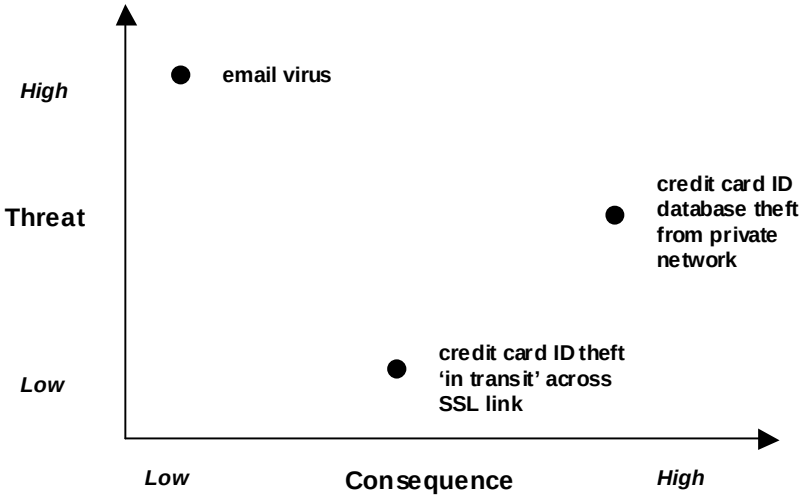

Figure 18: Assessing security risks[118]

Such an exercise is not easy however. With global Internet connectivity, the potential frequency and scale of exposure have reached new heights, making risk assessment all the more difficult. For example, it has been estimated that theft of credit card details alone is expected to cost credit companies $US 5.6 billon by 2002, possibly as much as $US15 billion by 2003,[119] and this may be just the tip of the iceberg.

To make matters worse, there are still differences of opinion amongst IT security professionals about the validity of fundamental PKI technology based on the X.509v3 standard, and there has been harsh criticism about strategies used when implementing enterprise-wide PKI[120]. Some critics have suggested that "PKI companies need e-commerce far more than e-commerce needs PKI companies"[121]. Clearly however, many applications of PKI and related technologies are considered successful: the reduction of the fraud rate in France from 0.11% in 1990 to 0.021% in 1997 is largely attributed to the high penetration of a combination of technologies - digital signatures and smart-cards.[122]

Given the apparent success of such high-tech solutions, it is natural that governments and multinationals want to use the best protection possible for their own and their customers' interests. In the past, dominant supply-chain participants have insisted on such security measures being adopted by their smaller partners. Such strategies may work against smaller businesses, particularly those in developing economies. Whilst smartcards may significantly reduce the risk of identity theft (such as credit card details), it is an impractical technology for many, either too costly or simply not accessible.

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[118] using nominal data points.

[119] Australian (IT section - article) 03/04/01 : "Cybercrime Czars"

[120] Australian (IT section - letter) 20/03/01 : "PKI Dangerous for Health Sector"

[121] "Experts warn of PKI dangers": http://www.zdnet.co.uk/itweek/analysis/200/47/internet

[122] Australian (IT section - article) 03/04/01 : "Cybercrime Czars"

Companies and governments who demand highest-level security from all partners (such as the use of smartcards for storing digital signatures) will prevent many from participating at all. It is now being recognised that such ‘one-size-fits-all’ security measures are not practical, nor even necessary, particularly in the case of high-volume, low-value transactions. Again, it is a question of adopting security measures within a framework of managed risk.

8.5 Legal & Jurisdictional Issues

Business operates in a legal environment and many laws have been enacted to support business practices in general. It is often difficult however to understand how the law applies more specifically to electronic commerce. The problems that arise are often exacerbated by the complexities of cross-border trading.

The following are contributing factors:

- current law may not adequately cover situations that arise in e-commerce. For example, the ability to gather, correlate and search large volumes of information about individuals and organizations raises questions of privacy that were quite unimaginable before the Internet technology was developed.
- Legal systems around the world are having difficulty in keeping pace with the rate of technological change. The main issue has been that of modernising pre-existing trading laws. Whilst there have been many outstanding achievements in dealing with these issues, there is a danger that the new laws are cast in terms that are only applicable to current technologies.

  For example, many economies have adopted laws to address the legal status of digital signatures, but how many of them would recognise biometrics technology as a legal proof of identity?

  To the extent possible, 'future-proofing' laws applicable to e-commerce should be undertaken as a high priority.
- Even if existing, national or state laws are applicable to e-commerce trading, they have often been enacted to apply within the originating economy or state– not internationally. So in cross-border trading, the question arises: which law applies – local or foreign?

  "Each country has its own rules for determining whether local or foreign law will be applied. There are different rules for tax, criminal penalties, contracts and torts. They follow a general pattern from country to country, but differ in detail."[123]

  This means that the e-trader must be aware of the specific legal consequences of trading with a particular economy. For many businesses, larger and smaller, these issues are daunting. Commercial services are now being provided online to help traders navigate through the complexities of cross-border trading. Clearcross[124] is one such service provider who is providing online access to "billions of documents on international trade regulations"[125].

[123] see " Electronic Commerce in the 18 APEC Economies - A Legal Guide", http://www.dfat.gov.au/apec/ecom/LEGAL.html

[124] http://www.clearcross.com

[125] as reported in "E-business Lurches Abroad" http://www.interetweek.com/newslead01/lead031901.htm

With cross-border trading in particular, many areas of the law become confusing and even contradictory: contracts, taxation, customs and tariffs, privacy and other regulatory issues. Despite the fact that national and international efforts are being undertaken to clarify and simplify matters, expert legal advice will often remain an essential service for businesses that undertake e-trading. Advisory websites and online services are also appearing, for example:

- "E-com Legal Guide" by Baker & McKenzie;[126]
- Review of digital signature law around the world.[127]

The United Nations Commission on International Trade Law (UNCITRAL) instigated one of the most significant international undertakings relating to the legal aspects of e-commerce[128]. The Model Law on E-commerce was completed and adopted in 1996. A second initiative, Uniform Rules on Electronic Signatures, reached completed draft stage in September 2000.

The Model Law on E-commerce provides a framework that is intended to be incorporated into actual laws passed in respective economies. Its purpose is to offer legislators internationally acceptable rules, which deal with legal issues of e-commerce in a uniform way, addressing the basic issues of legal validity of electronic commercial documents. The Model law has been adopted in the laws of several APEC economies.

Some legal issues that are commonly encountered are discussed briefly below.

8.5.1 Contracts and digital signatures

The use of digital signatures in electronic contracts has been given priority in national and international legislative forums. It may not be widely known that "most e-commerce contracts ... do not have to be signed, or even in writing, to be enforceable"[129]: nevertheless, when signatures are required, local law will determine the validity of digital signatures.

Many APEC economies now have a legal framework that recognises the validity of digital signatures. For example, the Malaysian Digital Signature Act (1997)[130] states that:

Digitally signed document deemed to be written document

(1) A message shall be as valid, enforceable and effective as if it had been written on paper if-

[126] available at: http://www.bakerinfo.com./apec

[127] available at: http://cwis.kub.nl/~frw/people/hof/DS-lawsu.htm

[128] see under: http://www.uncitral.org/en-index.htm

[129] see "Electronic Commerce in the 18 APEC Economies – A Legal Guide – Signature, writing and other formalities" http://www.dfat.gov.au/apec/ecom/LEGAL.htm

[130] http://www.malaysia.net/dap/act.htm

(a) it bears in its entirety a digital signature; and
(b) that digital signature is verified by the public key listed in a certificate which-

(i) was issued by a licensed certification authority; and
(ii) was valid at the time the digital signature was created.

In cross-border trading, laws concerning the use of digital signatures in contracts need to be uniform and transparent. This is not currently the case: because the parties are uncertain about the legal status of digital signatures, or because the law itself is unclear, it is still the case that electronic trading agreements are often executed under the umbrella of a paper contract with hand-written signatures.

8.5.2 Tax laws

Again, most tax laws governing buying and selling were originally written for a local community. Taxation of sales made internationally has always suffered from complexities and loopholes. These become more pressing matters in e-commerce where savings in reduced cost and cycle-time can easily be eaten away by resolving difficult tax issues. Currently, international e-traders must comply with tax laws as they vary region to region. This variety in itself is difficult to manage. Moreover, the relevant laws often contain loopholes, which can work in favour of sellers (i.e. they are exempt from sales tax if the purchase is 'remote') until they are closed up (sellers may become liable for sales tax in two places at once, both 'remote' and 'local')[131].

Efforts are underway to harmonise e-commerce tax laws around the world. The OECD for example has instigated several technical advisory groups (TAGs) to make recommendations in several areas. Immediate resolution is unlikely however: despite general agreement in the form of the "Taxation Framework Conditions"[132] (Ottawa, 1998), by finance ministers from around the globe, that VAT should be collected in the place of consumption, a recent effort by the European Union (EU) to force non-EU economies to collect VAT from digital sales stalled when the proposals were found to be unacceptable and "overreaching in many countries".[133]

Technology vendors are starting to offer products to alleviate the taxation difficulties that e-traders face. The company Taxware[134] markets WORLDTAX™ for the calculation and reporting of Value Added Tax, Goods and Services Tax, sales tax and consumption tax. It includes features that allow compliance to the reporting requirements for cross-border transactions. It covers the U.S., European, Asian-Pacific and South American economies.

[131] see "E-Commerce and Harmonisation of World Tax Systems" http://www.ecommercetax.com/doc/112600a.htm

[132] http://www.oecd.org/daf/fa/e_com/framewke.pdf

[133] "EU Withdraws Proposals for VAT on Digital Sales" http://www.ecommercetax.com/doc/020401.htm

[134] http://www.taxware.com

8.5.3 Customs and tariffs

It has long been recognised that reducing the complexity and variety of customs processes around the world can greatly improve the efficiency of cross-border trading. Below are some figures that illustrate the issues:[135]

- The Pacific Economic Cooperation Council in its *Report on Trade Impediments* found average international transactions involved 27 to 30 different parties, 40 documents, 200 data elements (30 of which were repeated at least 30 times) and re-keying in of 60 to 70 per cent of all data.
- The United Nations Committee on Trade Development estimated that documents and other import formalities amount to 7 to 10 per cent of the value of all goods traded internationally. This amounts to twice the total revenue of the world's shipping industry.
- The WTO has found that customs is included in every trade transaction at least twice and the European Union has estimated simplifying customs procedures could save US$8 billion.

Since the first World Customs Organisation's[136] Kyoto Convention for Customs Simplification and Harmonisation in 1974, leading global economies have been working to eliminate unnecessary barriers to global trade by streamlining and standardising customs procedures. Such issues become even more significant when engaging in e-business. As the base cost of electronic transactions falls, the relative costs of more expensive customs processing becomes even less tolerable. For such reasons, the Kyoto Convention was updated and restructured in 1999, with one specific goal to address the issues of electronic processing. The Convention was unanimously adopted by 114 customs administrations.

Outcomes of the world leaders' G7 meetings in 1996 further complement the Kyoto Convention and have lead to the real possibility of a global standardised electronic declaration for the clearance of international goods movements. In some parts of the world, such infrastructure has already emerged. For example, Australian and New Zealand Customs have acted jointly on G7 outcomes. The result has "drastically reduced the amount of data required by Customs administrations from over 800 data elements to a little over 210"[137].

How tariff regulations apply to electronic transactions is also under global scrutiny. In May 1998, World Trade Organisation members agreed to a moratorium on the imposition of tariffs on electronic transactions. Whilst many believe that tariffs must be avoided to reap the potential benefits of international e-commerce, less developed countries cannot

[135] reproduced from http://www.customs.gov.au/media/manifest/april99/page17.htm

[136] http://www.wcoomd.org

[137] http://www.customs.govt.nz/commhome/g7data.htm

afford to lose such levies: India for example obtains 18% of its national income from tariffs[138].

The moratorium expired however in December 1999 after a WTO meeting in Seattle did not agree on its extension. APEC has since recommended a similar moratorium within member economies until the next WTO ministerial conference. [139]

Organisations such as Logisoft[140] provide services that deal explicitly with helping international e-commerce traders understand their cross-border tariff and customs obligations.

8.5.4 Dispute resolution

Much of the perceived value of B2B e-commerce is obtained from having a leaner, faster supply-chain, thereby reducing the cost of each transaction. However, if the cost of resolving disputed transactions remains high, the net benefit of improved supply-chains is considerably eroded:

"Already, business transactions are executed in nanoseconds while litigations can take years to settle."[141]

Should the dispute arise across borders, further complications are added which may prevent resolution at all: can the initiating party afford to take action in another economy? Does relevant national law of the other party even permit legal action to be taken?

For reasons like these, companies such as Microsoft, Daimler-Chrysler, and AT&T signed a new protocol designed to reduce the cost of B2B dispute resolution[142]. It is intended to be applicable within the U.S. Announced by the American Arbitration Association (AAA)[143] the new protocol calls for:

- The use of neutral dispute resolution providers,
- A range of options and cost-effective methods to resolve disputes at the earliest possible stage,
- An emphasis on continuity of business through isolating disputes and resolving them with minimal disruption to other transactions, and
- A commitment to use appropriate technology to aid dispute resolution.

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[138] http://www.usatoday.com/life/cyber/tech/ctg732.htm

[139] http://www.abaconline.org/news/APECECOM.htm

[140] http://www.logisoft.com

[141] "Managing E-Commerce and Online Business", Prof. James K. Ho, Strategic E-Commerce Management Workshop, NECTEC, Thailand, May 23-25 2001

[142] "Heavyweights Unveil B2B Dispute Protocol" http://www.ecommercetimes.com/perl/story/6480.html 5th January 2001.

[143] http://www.adr.org

It is understood that the AAA is developing a new technology-focussed dispute resolution service.

It remains to be seen how this strategy works in practice, just within the US national context. Similar technology could no doubt be deployed across national boundaries for cross-border trading. This would however need the framework of appropriate multi-lateral agreements that recognised the dispute resolution service as legally binding and locally enforceable.

8.6 Language and Culture

It has been suggested that international initiatives currently approach e-commerce as a related set of economic, technical, regulatory and legal issues which tend to overlook various human factors:

"The language used is that of economics and engineering … The challenge is to also include the language of culture, communication and meaning."[144]

In Western economies where English is the dominant language of business and technology, such issues have until recently been largely undisturbed. The potential of global marketplaces have changed attitudes and understanding to some extent, but certain issues remain.

Above all else perhaps, with international trading, there is the need to communicate effectively. 'Localisation' is a service now offered by specialist companies, but the focus is on website presentation for B2C trading. B2B trading poses slightly different challenges, where the goal is unambiguous, common understanding between trading partners, at every stage in a collaborative business process. English will undoubtedly remain the dominant language of international trade, and will certainly be adopted by global supply-chains dominated by multinational companies. This may be of little comfort to small businesses in non-English speaking economies with access to only limited English language skills, though of course it is not an absolute imperative to engage in international trade. National or regional markets can be alluring enough to launch new e-marketplaces using only the vernacular. China EB[145] for example appears to offer no English pages; Chinese Taipei's b2b.com[146] resorts to Chinese after the homepage is presented in English.

The core issues relating to language and meaning are addressed below.

8.6.1 Language and Meaning

The English language and Western culture dominate the Internet but the picture is changing. Within at most a few years, "the majority of web users will be speaking a language other than English." [147]

Much of the infrastructure to enable the multi-lingual Web is already in place[148]. This has arisen primarily to satisfy local needs within economies, but equally provides benefit for the purpose of international e-commerce, for example:

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[144] "Electronic Trading in the APEC Region", Supriya Singh, Centre for International Research on Communication and Information Technologies (CIRCIT), working paper 1998/2, available at http://www.circit.rmit.edu.au

[145] http://www.chinaeb.com

[146] http://www.b2b.com

[147] "E-biz Must Chart an International Path": http://www.internetweek.com/eresearch01/data031601.htm

- Unicode[149] representation of all of the major languages in the world has been achieved, with 'plenty of room to spare' for additions and enhancements
- Support for Unicode is now a feature of major software applications and standards (e.g. Windows NT 4.0, Windows 2000, Java, HTML 4.0 and XML)
- HTTP/1.1[150] permits selection of documents in the language of a user's choice (if available)
- The OpenTag[151] initiative continues to provide the tools and infrastructure for XML localisation. In particular, the DataDefinition group are focussing on "defining a standard format for carrying translatable data between tools…. [this] is an effort to create a "modern" OpenTag ... [since] many aspects of XML have changed since its creation" [152]

For casual Web browsers, translation of websites and web searches 'on-the-fly' is becoming commonplace. For example, the Google search engine now offers:

- translation of its search facilities into 36 languages
- translation of search results into English from Italian, French, German, Spanish, and Portuguese.

Major problems remain however for multi-lingual e-commerce initiatives:

Availability of translation services: for many languages in the APEC region, translation services, automated or otherwise, are not available cost-effectively. Some 'Oriental-Western' services, targeting languages such as Japanese and English, are beginning to emerge over the web however (See for example the services listed at the 'Babelfish' site[153]).

Accuracy of automated translation: whilst automation tools may provide an adequate translation for casual users, they are far too inaccurate for important financial and legal documents. Consider for example the following translation of a document in Spanish regarding e-commerce in Mexico[154], provided by Google[155]:

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[148] "How XML and Unicode are making it easier to publish multilingual electronic documents": Multilingual Communications & Technology, Volume 9, Issue 3. available at: http://www.tgpconsulting.com/articles/xml.htm

[149] see: http://www.oasis-open.org/cover/unicode-xml.html

[150] W3C's RCF 2616: Hypertext Transfer Protocol -- HTTP/1.1 http://www.w3.org/Protocols/rfc2616/rfc2616.html

[151] http://www.opentag.com

[152] http://www.egroups.com/group/DataDefinition

[153] http://www.babelfish.com/Translations.shtml

[154] http://www.maestrosdelweb.com/editorial/opinion/ecommerce_mx.asp

[155] http://www.google.com

Original	Translation
Aquí en México últimamente han estado promocionando fuertemente aquellas empresas que dicen ser la mejor opción de comercio electrónico, donde estan gastando fortunas en anuncios de radio y televisión.	Here in Mexico lately they have been strongly promoting those companies that claim to be the best option of electronic commerce, where estan spending fortunes in announcements of radio and television.

Despite this, translation software is clearly essential where throughput of translated documents is an issue. For example, Apple is using content management software from Sentius corp[156] to translate about two hundred documents a day into seven languages.

The cultural context: often a raw translation of text will be inadequate for a local context. Issues here include:

- web-page layout – is the page to be read left-to-right or right-to-left?
- how the individual, in a given cultural context, is to be addressed
- how a particular theme or issue is best portrayed to the local audience.

These issues mitigate in favour of human experts providing the translation service rather than relying on complete automation. Such problems manifest most prominently in the B2C context, where the success of the site depends on encouraging the individual to spend. The INGECEP[157] project has attempted to address some cultural issues for the international B2C scenario. Similar problems are revealed in some elements of B2B e-commerce however, especially where human interaction is required in playing out a particular business process.

Other aspects of B2B e-commerce can be exploited to ease the problems of multi-lingual interaction. Because a business interaction gives a well-defined context, it may be possible to both simplify the language needed and provide a more accurate translation (whether by human or by machine). "Tiger Talk" [158] is a business enquiry system that exemplifies this principle. It uses email to translate queries about businesses in constrained contexts, thus providing simple and accurate translations. It covers translation to and from English and languages from South-East Asia in particular.

General translation software will always be error-prone, though flexible. Multi-lingual *generation*, on the other hand, will give greater accuracy, but there are different costs and benefits. Language generation exploits knowledge of particular contexts to generate concise but accurate 'natural language' documents. Typical exploratory uses have been for weather and traffic report generation, in multiple languages[159]. Similar generation techniques may be applied to automated business interactions, generating documents in all languages needed for trading across continents.

[156] http://www.richlink.com/RichLink/english/index.html

[157] http://www.apectelwg.org/apecdata/telwg/23tel/bfsg/bfsg_11.htm

[158] http://www.cyber-tigers.com/tigertalk.html

[159] http://www.cmis.csiro.au/iit/Projects/CARRS.htm

9 Addressing the Issues

There is already a great deal happening worldwide to speed the introduction of effective, accessible global e-commerce infrastructure. Some projects are under the governance of APEC, whilst more are taking place in a variety of other national and regional initiatives.

9.1 APEC Initiatives

Several APEC projects are addressing critical aspects of e-business with particular emphasis on issues of importance to the APEC economies. They include:

- The APEC Working Group on Electronic Financial Transactions Systems held its first meeting on February 28 2001 in Tokyo, Japan. The group is developing programmes to promote paperless trading in the financial sectors, in collaboration with the APEC Steering Group on Electronic Commerce. The scope of the projects is to include electronic payments systems and associated cross-border issues
- A new project addressing Global B2B Interoperability was proposed under the Business Facilitation Steering Group of APEC TEL 23. This will build on the results and experience drawn from the previous INGECEP (Integrated Next Generation of Electronic Commerce Environment Project) undertaking involving Korea and Japan. Part of its intended scope is "to develop a global B2B e-Commerce model which is interoperable enough to facilitate frictionless electronic transactions … To identify all and every specific barrier and inhibitor to the development and adoption of the interoperable model; and to present some appropriate solutions"[160].
- The work of APEC TEL's e-Security task group[161] includes ongoing initiatives in several areas. Security issues of critical importance to the APEC member economies are being addressed, such as those of PKI interoperability.[162]
- Work has been under way from some time in the APEC Transportation Working Group and the APEC Sub-Committee on Customs Procedures to promote 'paperless trading' through electronic processing of trade-related documents to accelerate and simplify these transactions. The APEC Electronic Commerce Steering Group has also supported this work program.
- Other APEC groups are increasingly turning their attention to the promotion of electronic modes of working as part of their core business in sectors including energy, tourism and agriculture. For example, the Agricultural Technology

[160] http://www.apectelwg.org/apecdata/telwg/23tel/bfsg/bfsg_10.htm

[161] http://www.apectelwg.org/apec/atwg/previous.html#estg

[162] http://www.tel23.org/Documents/estg/PKI%20demo2/index.htm

Cooperation Working Group is now working to encourage electronic transmission of sanitary (health) and phytosanitary certificates.

9.2 Regional Initiatives

There are many government sponsored e-commerce initiatives underway, with new additions emerging constantly. For example:

- Singapore has recently set up a National Trust Council to address "best practices related to e-commerce [security] "
- Mexico has announced that the E-Mexico project will be implemented in 1 year
- Korea is to invest US$570 million in what is being called e-Korea.[163]
- In the US, the E-commerce Outreach program offered by the Manufacturing Extension Partnership (MEP) program within The National Institute of Standards and Technology (NIST) has provided the means to "provide continued funding for approximately 200 information technology professionals who were … to work on Y2K outreach. It will also enable NIST MEP to develop tools to help small firms not only better understand e-commerce but to develop and implement an e-business strategy and use e-commerce technology".
- In Hong Kong, the initiative known as Tradelink Electronic Commerce Ltd[164] (a joint venture between Government and private sector shareholders) has the mission to "help the local trading community enhance its efficiency and stay competitive in the global market-place through greater use of electronic commerce". It offers many services including valuable house-keeping such as:
  - value-added transaction management facilities including message checking, matching and validation
  - message authentication and security
  - electronic billing and payments
  - message archiving and audit trail services.

  Tradelink also provides specific assistance to SMEs (responsible for over 87% of Hong Kong's export trade) by providing low-cost packages such as:
  - The SilkNet Service Package
  - The ValueNet Service Package
  - A secure Internet service
  - Special facilities for non-computerised traders.

[163] http://www.bmck.com/ecommerce/whatsnew-global.htm

[164] http://www.tradelink.com.hk/tlk.htm

- The Trade Point Programme, initiated under the auspices of the United Nations, with the goal to "foster participation in international trade, in particular of small and medium-sized enterprises giving special attention to LDC's and other countries less advanced in the area of trade efficiency" [165]. Participating economies and enterprises use Internet technology to publish and respond to "Electronic Trading Opportunities" as well as other types of information regarding existing trade regulations, banking practices and market intelligence.

[165] http://www.wtpfed.org/gtpnet-e.html

9.3 Ways Forward

There are many ways in which such programs can address needs within certain communities. Topics might complement current initiatives that address the needs of smaller organizations that are to conduct electronic trading with larger partners (e.g. Governments and MNCs), possibly across national boundaries. Possible themes are proposed below in terms of the following framework.

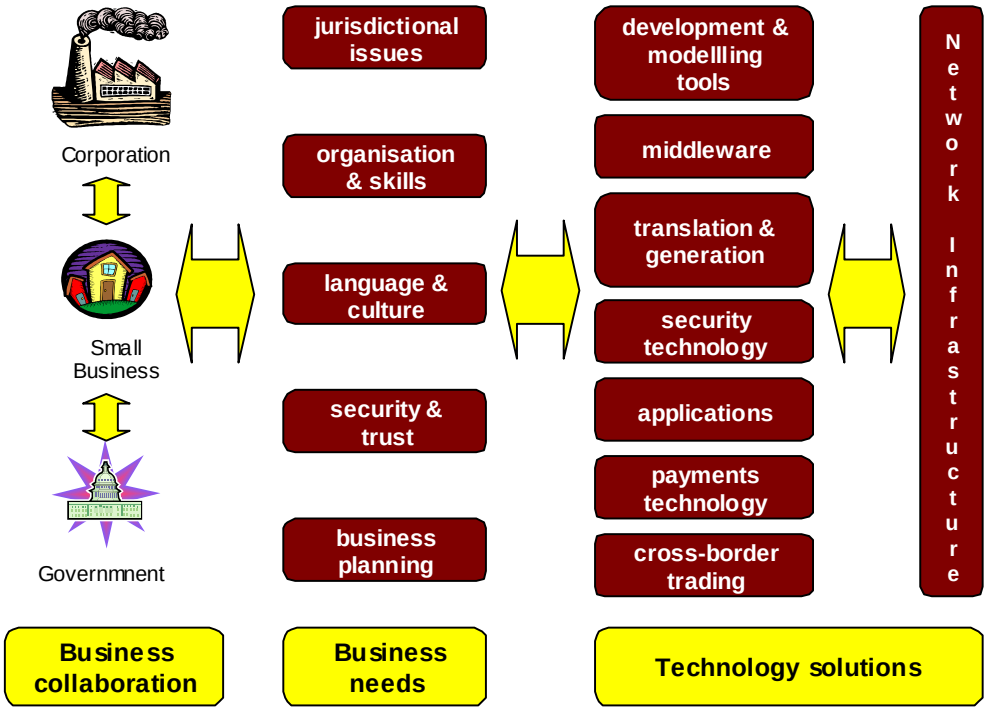

Figure 19: A framework for assessing e-commerce initiatives

9.3.1 Business Collaboration

Many of the problems that face small businesses arise because of the ways in which large organisations want them to collaborate on-line. Governments can play a significant role here, in easing the adoption of e-commerce by small to medium-sized organisations. They can set examples by moving their businesses to on-line channels. Such programs might encourage innovative approaches to on-line collaboration. There may be room for focussing on the problems that SMEs face in dealing with larger organizations that may have what appear to be rather daunting integration environments. This might include setting up loosely-coupled, low-cost Internet-based B2B infrastructure to help SMEs get

experience with being on-line, using PKI technology, interfacing to accounting packages, new payment methods, and so on.

9.3.2 Business Needs

Initiatives that encourage self-reliance for SMEs are most practical in this area. They will deal with training and skills provision and other organisational needs. Whilst there are many professional providers of training and change management services for businesses moving to e-commerce, these are often too expensive for SMEs, or not available at all in some parts of the world. Some consideration may be given to extension services or even self-help kits[166], with a specific focus on smaller businesses. Such tools could be extended to consider issues as outlined below, as well as assisting with assessment of the technology infrastructure required to support the business.

Their impact could be extended considerably by the support of community-based self-help projects and mentoring schemes. This was one of the reasons for the success of the Southern California Communities of Commerce Project[167]. With proper co-ordination, such schemes will also help reduce the overall cost of training.

Areas covered would include:

- Business planning and business models: developing business models and understanding their potential and their risks is just as important with Internet trading as with any other environment. Schemes to offer assessment services could be developed, possibly to specific communities wishing to conduct e-commerce trading. The goal might be to help communities form around geographic regions and common business sector interests: new business models for new and existing supply chains could be targeted, with the potential role of intermediaries an important aspect to consider.
- Security and trust: support to be offered with designing security policies and procedures, then acquiring appropriate technology and organisational practices to implement them.
- Legal and jurisdictional issues: As noted, Web-based document collections are emerging that permit the reader to examine the laws relating to trading within APEC economies. Interpreting these laws for a particular trading context remains an expert task. There may be potential for a web-based service, perhaps with simple queries automated, to assist the trading parties understand the laws that pertain to their international trading.
- Language and culture: The potential costs and benefits of providing further automated multi-lingual support for the human interactions in B2B e-commerce

[166] Similar tools are already available; for example, the Information Technology Planning Management Tool. This was developed by the U.S. Department of Commerce to assist organizations to examine their current IT usage and plan for additional IT investment to improve their operations. For details, contact ocbe@ita.doc.gov

[167] http://www.commerce.net/research/ebusiness-strategies/2000/00_01_r.html

warrants further investigation. Integration with B2B collaboration design tools may be of value, particularly as their cost falls and their capabilities improve.

9.3.3 Technology Solutions

Technology is important but ideally needs to serve business issues rather than drive them. The overarching goal could be expressed as: low-cost, high-integrity e-commerce environments for international B2B trading. Despite the desire for simplicity, this is an distant goal rather than a starting point, so and the technical skills of an architect will be still be needed to address issues such as scalability, throughput, transaction management and availability. Some strategies that might be employed are outlined below.

- Use of low-cost 'Web services' technology might prove beneficial by easing integration with existing supply-chains. Integration with typical desktop accounting and business planning packages would be valuable to investigate.
- Similarly, the use of low-cost collaboration design technologies is of interest. In the future, large and small supply-chain partners alike might adopt tools that are easy-to-use. Again, integration with typical desktop accounting and business planning packages would be valuable to investigate.
- Use of open standards, based on XML, for business messaging should be adopted where possible. The complications that arise from interoperation between proprietary software across organizations are important factors that need to be taken into account.
- Integration solutions using open-source (i.e. public domain) integration technology are now possible. The costs and benefits for restricted budget, restricted functionality integration scenarios could be investigated.
- Leverage existing systems. In general, vendors provide limited integration across the enterprise, so business should use existing infrastructure and build an integration layer on top of it. Using wrapper technology, or interfaces using Web services, will insulate the legacy system and ultimately make the solution more flexible.
- The value of traditional message-based integration should not be forgotten. This provides a simple solution for distributed transactions. Using distributed components and messaging is another feasible approach to achieving real-time business integration.