

Lessons Learned from the History of Interoperable B2B Communication

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“If you would understand anything, observe its beginning and its development.”

—Aristotle

Over the past 50 years, technology has made it possible for organizations to interconnect their internal business processes with each other. We see this trend today with the outsourcing of services such as travel or human resources. However, it was not always this way. The history of business-to-business (B2B) communication offers some important lessons which can be applied as we move into the future. This article will focus on the development and evolution of the secure messaging standard, EDIINT or AS2 as a case study for lessons learned in the adoption of interoperable B2B technology.

Lesson One: Solving the B2B communication problem takes time and effort.

The logistics challenges presented by the Berlin Airlift of 1948 were the catalyst for the development of the standard manifest and the creation of EDI in the late 1960s to facilitate global communications and trade. The review of history pinpoints the amount of time and effort used to build EDI to what it is today.

During the 18-month Berlin Airlift, the United States and Great Britain supplied food and basic necessities to West Berlin's 2 million residents during the Soviet Union's embargo of the city. The logistics effort was so intense that during the operation's peak, a plane was landing every 30 seconds and directly taking off for another load—24 hours a day, 7 days a week. They were supplying more than 4,500 tons of food and 15,000 tons of coal a day during the winter season. This was by far the biggest logistics effort ever conceived at the time, and those involved faced a nightmare in terms of processing the paperwork. The supplies were arriving and being unloaded so fast that it exceeded the capacity to process the supporting paperwork—paperwork complicated by the fact that it was composed of differing manifests, languages and copies. To reconcile this problem, the standard manifest system was devised to provide a standard format for business data exchange.

The logistics headaches of the Berlin Airlift also pointed to the need for a more efficient communications system to facilitate exchanges between suppliers and receivers. Electronic Data Interchange (EDI) emerged in the late 1960s to provide a digital messaging solution to take advantage of the emerging computer and communications technology. The paperwork, now in electronic form, could easily be handled and distributed between the suppliers and those receiving the goods, allowing the logistics information to keep pace with the materials moved by the transport and rail industries.

EDI first launched within the transportation industry in 1968 when the U.S. Transportation Data Coordinating Committee (TDCC) was formed. The TDCC coordinated the development of translation rules among four existing sets of industry-specific standards. A further move toward standardization came with the X12 standards of the American National Standards Institute (ANSI), which gradually replaced those created by the TDCC. Internationalization was formalized in the 1980s with the formation of the United Nations Electronic Data

Interchange for Administration, Commerce and Transport (UN/EDIFACT) organization.

The lessons learned from the Berlin Airlift show that it takes significant time to identify and resolve interoperability issues and that the parties involved must agree on both the format of the business data they are to exchange and on a standard technology for exchanging information.

Lesson Two: The goals of B2B Interoperability must be defined.

Clearly, the hallmarks of these collaborative efforts are that (1) all parties interpret the information in the same way, (2) each understands how to act on the information received, and (3) all parties know what to expect from each other in all aspects of the exchange. We could restate the answer to this question in terms of explicitly defining B2B interoperability—key points would be that all parties understand the:

- Syntax being exchanged
- Semantics being exchanged
- Scope of required actions and responses (sometimes referred to as the choreography of the exchange)

Technical interoperability between computer systems is an invisible, but critical component in the support infrastructure for internal or external business processes. Interoperability can be very simple, such as the phone system which transmits information without sender or receiver necessarily understanding or analyzing what is being transmitted or received. It also could involve complex business interactions where business information and data must be exchanged and processed among organizations, such as the reliable, efficient routing and delivery of overnight packages.

Lesson Three: The ROI must be there in order to achieve the goal.

There have been thousands, if not millions, of hours invested in EDI development and deployment during the last 40 years in all of the G8 nations, as well as in global industries such as automotive, retail, grocery, transportation, shipping, rail and air. The savings from these implementations are often not well-documented because the information is often considered confidential. However, one can see from the number of deployments that many business leaders have been supportive of the investment in interoperable IT systems because of the significant return on investment (ROI).

ROI is the driver for adoption of standards, adoption of new business models, and software sales. It is the catalyst that builds companies and adds revenue to the bottom line.

Lesson Four: The business model for B2B communication needs careful consideration.

Actual implementation of interoperable systems presents many challenges from both a technical angle as well as from the business model aspect because the business models supporting the technology must be cost effective for all parties. In the case of EDI, the advent of the Internet created new opportunities and business models.

Data interpretation is the first challenge. For example, "delivery date" may be defined and interpreted differently by industry segment or supply chain so the reconciliation of definitions must first be clarified and resolved. It is also often the case that the receiving party receives more data than expected and does not know which sections to ignore or reject. EDI translators were developed to catch these syntax errors. With the development of XML, schemas will find the syntax errors, but will continue to have problems with semantics.

EDI was first offered by Value Added Networks (VANs) which provided business messaging services via their proprietary networks. The proprietary nature of the networks provided security but VANs had to build gateways amongst themselves to overcome data interpretation problems since different companies within the supply chain chose different VANs. Small businesses (the ones that could least afford it) might find they had to use two VANs because they were doing business with competing customers and each was using a different VAN. VANs charged fees for each transaction and any delays between messages added cost.

As more industries recognized the cost-savings potential for using machine-to-machine transactions in B2B, demand grew to resolve the issues faster, cheaper and more consistently than ever before. The Internet boom in the 1990s took B2B communications to the next level as the Internet provided an alternative to proprietary VAN networks.

With the evolution of EDI to the open internet, there are several factors that need careful consideration for the business model for B2B communication. In order to achieve wide-scale adoption for B2B communication, a critical factor is enabling small business to communicate with big business. Price, functionality and choice of products is critical as we learned from the challenges with the early expense of VANs in EDI. Also, in offering service type portals or VANs, the downside is always "who will choose which service?" How do we get the portals to communicate between each other? How will the small business interface?

Lesson Five: B2B communication greatly differs from B2C communication.

Early protocols such as SMTP and HTTP had the luxury of incubating *in situ* interoperability at universities and research labs around the world long before the Internet's public and commercial explosion in the late 1990s

More recent Internet standards focused around B2B data exchange do not have the same luxury of out-of-the-box interoperability which is mission-critical to business process integration.

Underscoring the implementations of these early Internet protocols is the unspoken IETF philosophy characterized by the axiom, "transmit as tightly as possible and receive as loosely as possible." The IETF philosophy may never really be applicable to many B2B process exchanges, and arguably it does not seem to apply well in some areas of security.

Another key reason that protocols such as SMTP and HTTP were able to be implemented without certification or rigorous formal testing programs is that they were primarily business-to-consumer (B2C) or machine to human in their initial Internet-wide implementations and not B2B in nature. To this day, most SMTP and HTTP implementations are not machine-to-machine (M2M) as are the vast majority of the Internet-based B2B processes. When a human is directly involved in the data exchange loop, many interoperability problems can be corrected *ad hoc*, but M2M interactions require correction in the form of programmatic code fixes. In B2B communications, the sheer volume of daily financial transactions between supply chains requires Internet transactions to be as secure as those conducted in proprietary networks. A single failure between two trading partners due to an interoperability gap can cost both parties thousands of dollars. Outside of very mature security standards at the transport layer (TLS/SSL), interoperability around young and emerging security standards are prone to error.

Lesson Six: New B2B standards will always be evolving.

In the early 1990s, a new Internet messaging open standard was launched to address the demand for a secure and reliable B2B messaging: Applicability Statement 2 (AS2). Within a decade, AS2 became one of the most widely recognized messaging standards for B2B e-commerce with thousands of implementations worldwide. It enables users to connect, deliver and reply to data securely and reliably, thereby delivering cost savings and providing flexibility and control on how the data is utilized. Major supply chains in retail, financial services, pharmaceutical, consumer product goods, automotive and petroleum industries use AS2.

Since the launch of AS2, there are a number of other technology standards that hold significant promise for tomorrow's B2B communication. Web services does what AS2 can do, but also adds identity management capabilities and can handle the more complex style of "query-and-response" messaging, as well as the more traditional style of "AS2 document-push" messaging.

However, transitioning from an established communication standard to another has significant impact on the supply chain. The cost in technology and manpower and the emotional toll in dealing with change should be given serious ROI examination. The ROI (and the other lessons in this article) must be considered in order to make changes.

Lesson Seven: Transitioning from established business models for B2B is difficult—Think ahead!

To make a transition from the security of proprietary networks provided by VANs to an open Internet standard required confidence from the business community that the AS2 software products used for transactions over the Internet were reliable and secure. B2B communication represents the lifeblood of big business. Validation that a message has been sent and received is critical. Businesses need reassurance that software products are interoperable and provide the level of security required for their businesses. Software vendors must also recognize the value that a certification program provides in selling their products and that a vendor-neutral third party is needed to help resolve their interoperability issues. These factors converged and led to Drummond Group Inc. (DGI) to develop a B2B certification program starting in 1999.

A software certification program creates choices in choosing interoperable products with varying features and prices. This helps the small business gain entry into the marketplace with affordable technology solutions which helps them compete and do business with larger business partners. In the case of AS2, international adoption grew due to the openness of the standard and the “no boundaries” approach. These developments offered great benefits to the end-users of AS2 software and some additional challenges for certification.

It is very important to note that interoperability need not be based on EDI or XML. The important point for organizations conducting business with each other is to (1) find a mutually agreed upon technical standard, (2) provide well-defined exchange choreographies, and (3) test the data exchanges using interoperability testing prior to deployment in production environments.

Lesson Eight: Open source products are just another product!

The Web services arena has a number of open source alternatives to commercial offerings. While open source products are budget-friendly from a licensing standpoint and are usually the product of a diverse development community, open source products are still software products like their commercial counterparts and do not deliver interoperability out of the box. Unlike commercial products, open source products often do not have consistent funding and development is ad hoc via a user community.

So how could an open source product like the Apache Web server gain such a prevalent market presence? The Apache Web server was originally a B2C implementation. As long as humans are in the loop, interoperability is not so important for adoption because humans can correct spurious interoperability gaps. (See Lesson 5 above.)

The challenge for B2B communication in using open source is this: Will every business choose the same open source product? If not, then the interoperability problems in B2B communication will continue.

Lesson Nine: Interoperability certification for B2B communication is critical.

Despite the careful and thorough work of a standards body, nearly every standard leaves out rules or conditions which affect the implementation. Most standards have optional components using words such as "SHOULD" or "MAY." While they may be necessary to allow for flexibility, these words often lead to differences that create interoperability issues. Also, standards have "gray" areas where the requirement is not clear or can be misinterpreted. In these cases, developers either choose or are forced to make their own interpretation where the standard is silent or confusing and this is how interoperability issues arise.

The reality is that standards cannot ensure interoperability. No matter how well-written, there are gaps in standards. Interoperability testing can bridge this gap. A neutral interoperability test creates a forum for a common interpretation and implementation amongst a group of products. Through interoperability testing, differing interpretations are identified and resolved. Usually the vast majority of the testing participants agree on a common interpretation and the few dissenters make necessary changes. For the few issues which are more evenly divided among the participants, the standards producing body can be queried for its interpretation to bring everyone on board. Products tested for interoperability make adoption in the supply chain a reality.

At the end of each interoperability test, DGI writes and posts a final report which contains critical information on what was tested and includes the list of consensus items discovered during that particular test and previous test rounds. Consensus items include standards interpretation and other issues discovered and resolved during testing. The growing list of consensus items related to standards interpretation for each test round is evidence that the technical standards in and of themselves cannot ensure interoperability.

Certifying interoperability test results adds another level of accountability. The software vendors and the certifying entity are accountable for ensuring that the certification is managed in a thorough, detailed and auditable manner. Although many technical personnel may trust non-certified test results, business leaders who are concerned with ROI are more cautious. Senior management

usually requires a higher comfort level in purchasing software and subsequently desire accountability to ensure that the software is certifiably interoperable.

SUMMARY

It is clear that technology has come a long way since the days of the Berlin Airlift, but the lessons are worth being noted. Critical to the growth of successful B2B communication is:

- The recognition of the amount of work that is ahead
- A clear picture of the goal of B2B
- ROI must justify the technology investment
- A well-designed business process strategy that can grow with the underlying technology supporting it
- B2B communication differs greatly from B2C
- There will always be a new B2B standard developing
- Transitioning from an established business model is difficult
- Open-source products are just another product and do not deliver interoperability out of the box
- Interoperability certification is critical for end-user trust

As someone said, "The supreme purpose of history is a better world." And given the explosive growth in B2B technology in the last 10 years, change is our constant companion. Today, the Internet provides us with the roadway to communicate.

Keeping those roads open, secure and trusted is critical to the continued growth of B2B communications. These history lessons are important reminders as we develop the next generation of B2B roads together to create a more interconnected world.