The Impact of Common E-Business Interfaces

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Business-to-business (B2B) e-commerce has great potential to create new efficiencies for industries and their supply chains. While Electronic Data Interchange (EDI) over private networks has been used extensively for data interchange among large enterprises, it has had limitations of cost and rigid format specification that have precluded widespread adoption. Further, due to its batched nature, EDI is not well-suited to intensive real-time information exchange and application integration needed for supply chain activities such as collaborative forecasting and inventory management.

A number of supply chains now use just-in-time manufacturing processes and require quick access to information received from partner enterprises that EDI does not support. EDI does provide the connectivity and structured data interfaces needed for exchange of business information in one-to-one relationships, but it does not support process standards that would specify how IT applications at dynamic partnering enterprises need to process this data.

Data interchange using the Internet infrastructure has emerged as a viable platform for commerce, particularly due to the eXtensible Markup Language (XML) specification for document markup that eliminates the need to find a common application interface (API) for integrating inter-enterprise applications. XML-based dialogs among applications at different enterprises can define business processes between trading partners.

A continuing obstacle to widespread B2B commerce over the Internet, using XML documents as the payload, is the lack of business standards that would lay out the document schemas and the conditional choreography of document exchanges needed to complete a business process extended across multiple enterprises [2]. Without such standards, there is no common vocabulary to describe products, there is low visibility in the supply chain as sell-through information is difficult to aggregate, there
is limited data element reuse, and it is difficult to make product comparisons. Also, data exchange would need a lot of effort in one-to-one customization to achieve coordination with multiple partners that have different business practices. This article introduces standardized interface specifications and illustrates a framework to evaluate their business impact.

What Are Common E-Business Interfaces?

Common e-business interfaces refer to industry-level specifications for the dialog among IT applications at different enterprises, needed to orchestrate a business process involving multiple supply chain roles. In order to smoothly execute joint transactions, it is required that applications at each partner be able to talk to each other and trigger the required sequence of processes from the interface. A complete interface specification needs to encompass data dictionaries (that define the vocabulary), implementation frameworks (that define the technical platform), business message schemas (that define the structure of data elements), and process specifications (that define the processing of the data).

Consider, for example, an ordering process between a distributor and a reseller. The reseller order needs to be understood by the distributor’s e-commerce application in terms of the specific product that is being ordered and the contractual terms that are being solicited. At the distributor end, this needs to trigger the appropriate processes that will check on inventory status, allocate product for the order, and confirm a delivery schedule to the reseller. In a supply chain, an end-to-end process may demand that multiple processes at different players be simultaneously triggered necessitating the need for industry-wide standards. By agreeing on the specification for a common electronic interface for the ordering process in this supply chain, enterprises can improve the efficiency of business processes and greatly reduce the effort required to coordinate with new players.

There are now a number of industry-specific as well as horizontal process-specific initiatives to standardize these business interfaces. Such B2B interface specifications include Microsoft BizTalk, Ariba cXML, Open buying on the Internet (OBI), EDI/XML, OASIS ebXML, Common Business Library (CBL), and Information and Content Exchange (ICE) among others [1]. However, there is little understanding of the impact of such interfaces and there exists a clear need to motivate and shape their development through industry consortia.

The RosettaNet Initiative

In this article we present the results of a study to investigate the impact of such common interfaces. RosettaNet (www.rosettanet.org) is a consortium of major computer industry companies working to create and implement industry-wide, open e-business process standards. At the time of the study, RosettaNet had 28 board members (manufacturing, wholesale distribution, retail, shipping, financing, and end-user companies) that contributed to this research. The standards specified by RosettaNet provide a common e-business language, aligning processes between supply chain partners on a global basis. This study was conducted under the auspices of the RosettaNet initiative and involved interviews of supply chain managers and a survey of high-level executives (typically CIOs or heads of e-business initiatives).

RosettaNet Partner Interface Processes (PIPs) are specifications of common e-business interfaces for high-tech industry supply chains that define the electronic
execution of business processes between trading partners. PIPs fall into seven clusters, or groups of core business processes, that represent the backbone of the trading network. Each cluster is broken down into segments—cross-enterprise processes involving more than one type of trading partner. PIPs are comprised of specialized system-to-system XML-based dialogs. Each PIP specification includes a business document with the vocabulary, and a business process with the choreography of the message dialog (see Figure 1).

**Figure 1a.** Partner interface process.

**Figure 1b.** Example of change notification PIP (Source: RosettaNet).

RosettaNet PIP specifications define guidelines for implementation in the context of an e-business “to-be” model. RosettaNet distributes the guidelines to partners in the supply chain so that they can configure their specific e-business processes to interoperate with those of their partners. The specifications define partner roles, for example, catalog publisher, catalog distributor, order manager, requisition manager, and the structured properties that they exchange when they interact.

There are three components of PIP specifications relevant to application implementers:
• Action specifications describe the format of information that is exchanged between partners in the supply chain.
• Transaction specifications describe the sequence of information exchange and the boundaries of these exchange sequences that comprise a single unit of work.
• Process specifications describe the conditional choreography of these exchange sequences necessary to execute partner interface processes.

**What Is the Impact of Common Electronic Interfaces on Business Processes?**

As the consortium started developing the PIP specifications, the authors were charged by the RosettaNet consortium within the task of providing a framework to evaluate the impact of the proposed common interfaces on the computer industry.

We adopted a systemic perspective to gauge the impact of these interfaces and accordingly focused on the impacts at the level of industry supply chains. We identified the following high-level process clusters corresponding to the major touch points between partners:

- Partner, product and service review
- Product introduction
- Order management
- Inventory management
- Manufacturing
- Marketing information management
- Service and support

We sought to understand the impact of common interfaces on overall supply chain performance in each of these process areas. Here, we outline the process of uncovering the set of relevant supply chain performance metrics and then evaluating how they would be impacted.

**The Impact Framework**

Figure 2 shows the impact framework we developed to understand the impact of RosettaNet PIPs. This framework was used to guide our data collection to gauge the expected impact of RosettaNet PIPs. We propose that the impact would be manifested at the level of the implementing enterprises’ business relationships and ultimately at the supply chain level. The common electronic interfaces are expected to impact three fundamental supply chain capabilities, which in turn would reduce misalignments between supply chain partners and increase the opportunities through flexible integration of supply chain processes:

**Coordination Capabilities.** Coordination misalignments occur when business processes are not synchronized between business partners due to lack of common definitions or consistent document formats. Common e-business interfaces are expected to reduce uncertainty and ambiguity in information exchange and enable more information to be conveyed among business partners using the available bandwidth. Common business rules may be embedded in the PIPs making for easier coordination. Thus it is expected that transactions among business partners would be more efficient with the standards in place.
Plug-and-play capabilities. Plug-and-play misalignments occur when organizations cannot dynamically change trading partners or business process interfaces. Business standards are expected to make it easy for an enterprise to discover and start doing business with new eligible partners that become available. Common interfaces will reduce the specificity in transactions making switching of partners easy.

Knowledge creation and sharing capabilities. Knowledge misalignments occur when the information needed to make critical decisions is unavailable or is fragmented across different tiers in the supply chain. Common business interfaces will make it easier to encode knowledge and expertise in information exchange. Further, the act of coming together and creating common specifications is likely to be a signaling mechanism that will help build trusting relationships.

It is expected that advancement in these capabilities will, in turn, lead to a reduction in supply chain misalignments and an increase in supply chain opportunities. This will ultimately be manifested in the more operational metrics of supply chain performance.

Measuring the Impact of PIPs
We started the study by conducting interviews with supply chain managers in the computer industry to find out how they evaluated their supply chain's performance. This gave us an exhaustive list of metrics. We found that most of the metrics that were cited were operational manifestations of supply chain processes. While most of the metrics related to the core order fulfillment process, we also found executives looking at second-order change metrics such as the rate of introduction of new products or time to add a new channel partner. Next, we conducted a survey of RosettaNet board member company executives to judge the importance of these metrics and quantify the expected impact of common e-business interfaces.

In the survey, we first asked the respondents to rate the importance of each metric on a 10-point scale (10 refers to extremely important, 1 refers to not important at all). Figure 1 shows the supply chain metrics (aggregated over the 28 responding companies) regarded as the most important.
As is evident, the metrics deemed as important are focused on operational outcomes such as inter-enterprise process cycle times and costs, and are one step removed from the theory-based impacts framework that focuses on underlying causes.

**What Is the Expected Impact?**

In a second part of the survey, the respondents identified the impact of candidate partner interfaces on these performance metrics—both current and future long-term performance as well as the effort required to put in these interfaces—in terms of the required systems development and other organizational changes. It is important to note the deployment of partner interface standards may have significant costs in terms of systems changes and also in changing business processes—for example, a product change notification PIP may pose a need for updates of sales catalogs and configuration engines. The partner interfaces correspond to the ones that were being contemplated for specification development by the consortium. Some of these, like technical specifications, are content-oriented in nature while others, such as credit availability, are more process-oriented in nature.

Table 1 shows an index computed by dividing the evaluation by the maximum possible evaluation. For example, all respondents evaluated the catalog information PIP and rated the impact of having a common specification as high, medium or low. These scores were then added up across all respondents to yield the total impact. The
index was calculated by dividing the raw score by the total if all the respondents had rated that interface as having a high impact.

**How Do We Guide the Design of B2B IT Infrastructure?**

The survey results suggest the effort required in implementing different interfaces is very different and some of the interfaces may require substantial systems integration. Based on such an analysis it would appear that the development of some interfaces may need to be prioritized over others. Figure 4 shows the projects considered by RosettaNet for development mapped according to their current and future impact. The size of the bubble represents the perceived effort required to develop and deploy the specification. Ideally, projects at the outer frontier that are relatively low effort should be targeted first or this exercise could be used as input into the discussions and negotiations among the participating organizations. In this instance, it seems the product availability look-up interface is promising for development.

In order to appreciate the impact of common e-business interfaces in absolute terms, it is helpful to look at some benchmark implementation data. In a pilot implementation of the order interface PIP between an electronic controls manufacturer and a components distributor, the implementation time was approximately six months.

<table>
<thead>
<tr>
<th>Partner Interface</th>
<th>Impact on Current Performance</th>
<th>Impact on Future Opportunities</th>
<th>Effort Required in Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content Interfaces</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Forecasting Information</td>
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<td>0.24</td>
<td>0.51</td>
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<tr>
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<td>0.12</td>
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<tr>
<td>Price Protection</td>
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<td>0.14</td>
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<tr>
<td>Promotion Rules</td>
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<td>0.48</td>
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<tr>
<td>Catalog Information</td>
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<td>0.55</td>
<td>0.44</td>
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<tr>
<td>Technical Specifications</td>
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<td>Marketing Information</td>
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<td><strong>Process Interfaces</strong></td>
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<td></td>
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<tr>
<td>Availability Look-Up Interface</td>
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<td>0.49</td>
</tr>
<tr>
<td>Shipment Tracking Interface</td>
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<td>0.12</td>
<td>0.43</td>
</tr>
<tr>
<td>Credit Availability Interface</td>
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<tr>
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<tr>
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<td>0.48</td>
</tr>
<tr>
<td>RMA Interface and Flow</td>
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<tr>
<td>Order Status inquiry Interface</td>
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</tr>
<tr>
<td>Catalog Search Interface</td>
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<td>0.25</td>
<td>0.40</td>
</tr>
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</table>

Table 1. Expected impact of partner interfaces on supply chain.
As a result of this, the order response time was reduced from 8–10 hours to two hours for exceptions requiring manual intervention and less than 20 minutes for non-exceptions [3].

Insights from this study are also applicable to enterprises that focus on facilitating inter-enterprise business processes. B2B exchanges (such as Transora for the consumer packaged goods industry and Covisint for the automobile industry) that connect and aggregate supply chain players, are in effect defining an implicit set of partner interface specifications for connecting to other enterprises for collaborative or transactional goals. The evaluation (Table 1) suggests it is worthwhile to disaggregate the impact of B2B exchanges into the impact on specific process segments as different exchange features and functions may impact these differentially. A variety of vendors are also engaged in providing services to support inter-enterprise processes. These include companies offering process integration suites (for example, Webmethods and SeeBeyond), process redesign services (such as ARIS and Holosofx), and process management services (like Viacore). The study offers these enterprises insights for evaluating and positioning their services towards the interfaces that are likely to yield the most benefits.

Another critical insight from our evaluation is that potential future benefits from investments in common interfaces need to be considered in conjunction with the shorter-term benefits. Investment in common catalog formats, for instance, appears to have a great future upside as common formats could open up a number of opportunities for shared content and make new roles such as catalog aggregators viable.

While this study was conducted in the context of the computer industry, it offers both a framework for impact assessment and specific findings that could be instructive for interface standards-setting in other industries. Estimating the impact of PIPs on supply chain performance is a critical part of the whole process of redesigning processes for e-business. Greater effort could then be directed towards the dissemination and deployment of high-impact PIPs. We suggest that impact assessment needs
to consider the impact on current and future performance in terms of the metrics that are important in a particular supply chain’s context.

References


What are the Different B2B Technologies and What is their Support For Common Business Interfaces?

**Electronic Data Interchange** (EDI) is the computer-to-computer exchange of business data in standard formats. In EDI, information is organized according to a specified format set by both interacting parties, allowing a hands off computer transaction that requires no human intervention or rekeying at either end. The information contained in an EDI transaction set is, for the most part, the same as in a conventionally printed document. EDI ships transactions in mailbags as it was created for the days of low-bandwidth private networks. With the advent of high-bandwidth pipes and Internet availability, these processes can become more synchronous and conversational. The American National Standards Institute (ANSI) has chartered the Accredited Standards Committee (ASC) X12 to develop uniform standards for inter-industry electronic exchange of business transactions-electronic data interchange.

**XML**. The markup language allows the contents of documents to be specified and conformance to a basic document structure to be established. Tags are used to mark sections in documents, indicating actions or identification. Unlike EDI, the tags do not need to have fixed semantics and can be extended as well. Further, message content can be rendered in standard browsers and interpreted by humans, making it useful to small- and medium-sized firms. There are a number of efforts underway such as ebXML and RosettaNet are trying to specify the data and process specifications for common industry interfaces. Further, the Organization for the Advancement of Structured Information Standards (OASIS), a non-profit international consortium, is supporting the creation of interoperable industry specifications based on XML.

**Web services**. An alternative to using structured document exchange for supporting inter-enterprise information exchange, is the construction of applications relying on distributed object computing frameworks with application components running on different servers. A recent development has been the unveiling of Web services as the cornerstone for creating distributed applications. A Web service is a component that is accessible using standard Internet protocols. Web service architectures being unveiled by the major technology vendors (such as .NET from Microsoft) provide the ability for complex applications to be developed that incorporate the component services provided by service
providers. These frameworks also provide the ability to dynamically discover and connect to business services through public registries. The Universal Description, Discovery and Integration (UDDI) project (www.uddi.org/about.html) is creating the specifications for such registries. It is hoped that the light-weight Web services model will leverage XML, public standards, and simple network protocols to create a cross-platform, language-neutral lattice of clients and service providers.