Information and Communication Technologies

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Electronic Data Interchange (EDI) is a standardized rule-based means of electronic data exchange using a set of structured alpha-numeric linguistic strings, and constitutes an essential part of electronic commerce among enterprises for transferring a variety of documents (management, commercial, transport, etc.). With the rapid expansion of the Internet in the 1990s and thereafter, a type of EDI that takes advantage of the generally available Web services, or Web-EDI, has come into widespread use. However, insufficient standardization within the industries has led to the existence of multiple and dissimilar Web-EDI systems even in a single business sector, posing a problem that hinders the smooth flow of commercial transactions, i.e. the multi-screen phenomenon. Many enterprises that have introduced Web-EDI are faced with difficulties when trying to integrate it with their existing in-house system because there are various customer-specific EDIs. In Japan at present, 80 to 90 percent of major distributing and manufacturing enterprises have already introduced EDI, but only 10% or less of small enterprises are actually using EDI for their transactions.

Cloud computing has become the focus of attention in recent years because of its potential to invoke drastic changes both for the providers of enterprise information systems (IT vendors) and the users (enterprises at large). From the viewpoint of constructing and operating an EDI system, the utilization of the cloud environment helps reduce initial investment for IT system introduction and allows simpler co-existence of different EDI systems working in harmony. These characteristics raise the possibility of alleviating the multi-screen phenomenon, boosting the diffusion of EDI in many enterprises, especially in smaller ones.

As cloud computing, motivated by reduced initial investment, makes its way into a broader spectrum of enterprise activities, cloud-based EDI is expected to gain a wider share, especially among small and medium-sized enterprises. An open standard is required to provide effective use of EDI in the evolving cloud environment. In many countries other than Japan, EDI services are provided by public organizations. It is desirable that a free market mechanism will be established to distribute software functions supporting EDI services. A number of small and medium-sized software vendors could provide a spectrum of software for the multitude of new services required. Standardization efforts from a neutral point of view are the essential part of promoting EDI introduction: an activation of collaborative efforts among universities and industrial sectors is highly desirable toward this goal, as exemplified by many cases in foreign countries.

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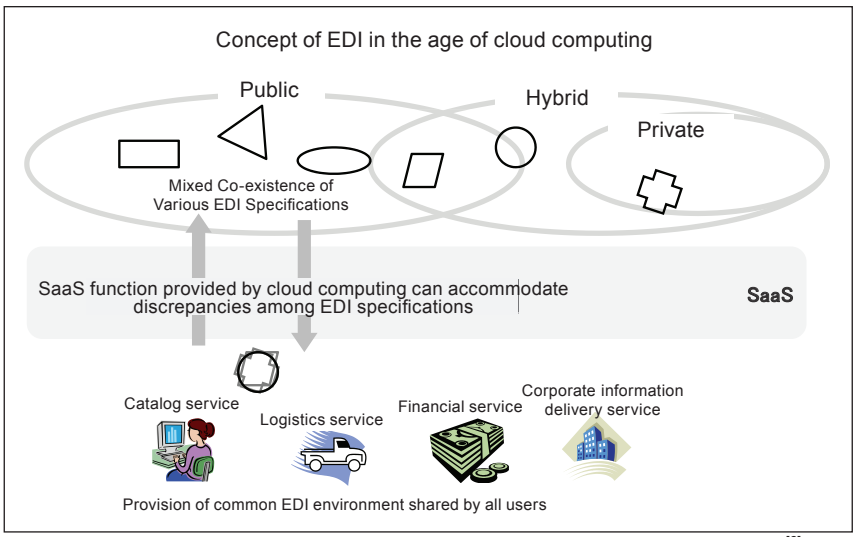

Figure : EDI in the age of cloud computing: as envisaged by JEDIC[6]
Concept of EDI in the age of cloud computing

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Standardization of Electronic Commerce in the Cloud Environment and Its Future Evolution

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1 Introduction—EDI in the Cloud Environment

EDI is an acronym for Electronic Data Interchange,[1] and is defined as the "means to represent a variety of documents—management, commercial, and transfer—using a set of structured alpha-numeric linguistic strings based on standardized rules."[2]
The use of EDI enables enterprises to exchange transaction information with other companies in a more effective way.

EDI has been considered an indispensable element of business-to-business transactions. From the 1990s onward, as the availability of the Internet became more and more ubiquitous, much effort has been made in each sector of industries and in each corporate group to introduce Web-assisted EDI systems, and for the establishment and dissemination of common specifications.

EDI is essentially a tool for information sharing among different and dissimilar organizations. Therefore, cloud computing has gained attention in recent years because of its promise to usher in a new aspect in EDI dissemination.

This report first outlines the current trend toward EDI standardization, and then considers the changes that may be brought about through the use of the cloud environment. It also considers the involvement to be shared by the universities contributing to these changes.

2 Standardization Trend of EDI

2-1 Roles of EDI in distribution channels

EDI is being used extensively to facilitate the flow of goods, and, although consumers seldom feel its presence in daily life, they very much enjoy the benefits it provides.

Let us first overview the role EDI plays when a consumer purchases goods from a manufacturer (see Figure 1).

A product, after leaving the manufacturer's site, passes through several steps of distribution channels before it is delivered to you. To make the description simpler, we assume that the distribution channel consists only of three steps: a manufacturer, a wholesaler, and a retailer. A closer look at the transaction processes in the wholesale stage shows that an order from a retailer comes as an "order sheet." The product, in response to the order, is shipped with additional forms, i.e. a "delivery slip" and an "invoice." Each form must be processed in the relevant department of the wholesaler: the order information must be entered into the information system for retrieving the right product, and the invoice must be processed in the system in the accounting department. By the same token, these forms are utilized for managing the sales activities and expense control of the retailer, and the shipment management and production control of the manufacturer.

A wholesaler usually handles a variety of products from many manufacturers and does business with a host of retailers. Even in the highly simplified transactional case described above, many forms are exchanged many times among the customer, retailer, and manufacturer; information exchange represents the business transaction.

In the past, these transactions were processed using pens and paper. EDI is an information system that helps make information exchange for transactions smooth, and represents one of the application areas for cutting-edge information systems.

2-2 Standardization in EDI

What kinds of arrangements are required for the smooth exchange of electronic forms among the enterprises involved? To implement EDI for the electronic information exchange of transaction forms, the arrangements on such items as those listed in Table

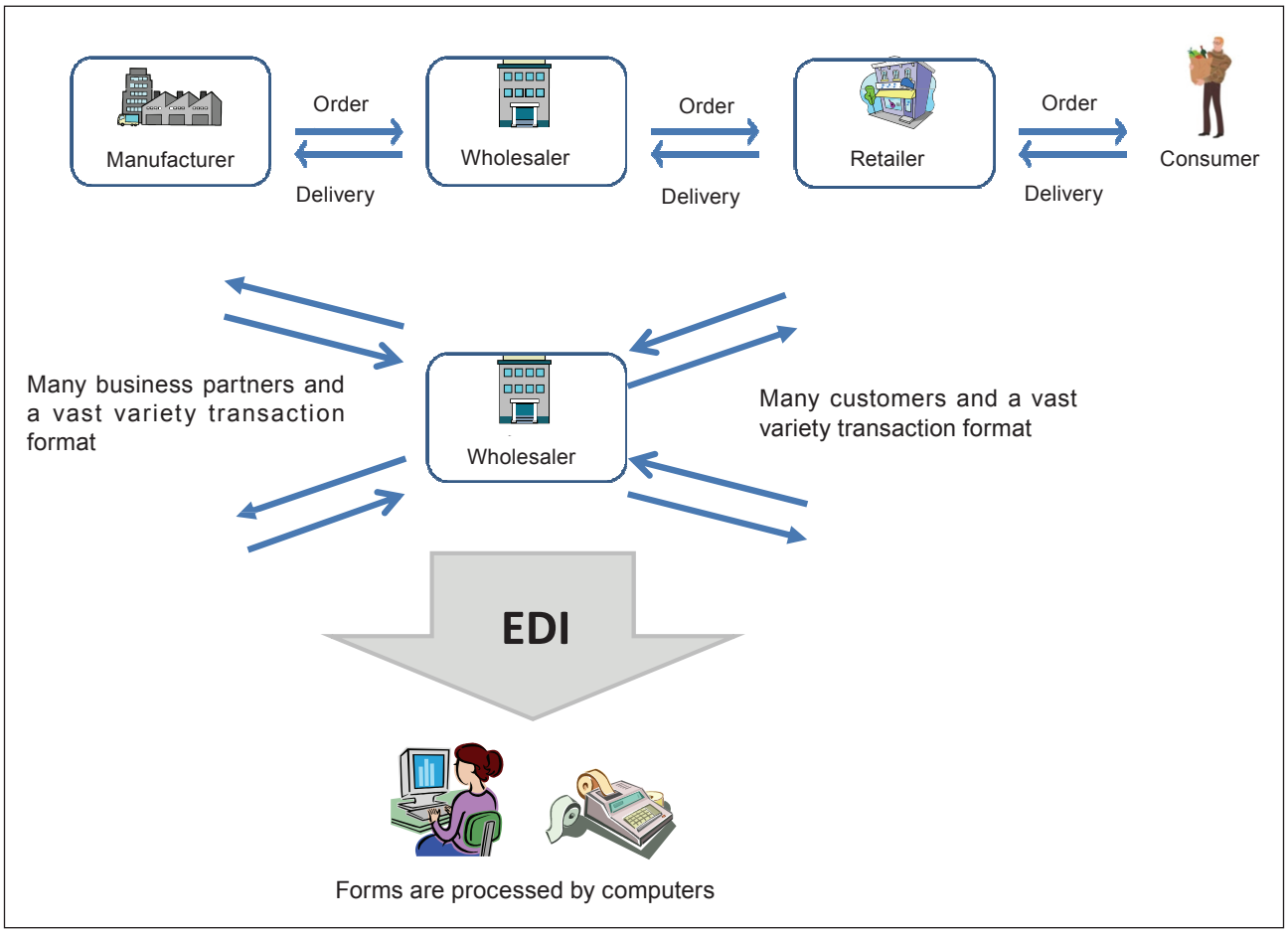

Figure 1 : Conceptual representation of EDI's roles in business transactions

Prepared by the STFC.

Table 1 : Summary of EDI standards

Summary of EDI standards		
Technical items	Representation of information	• Message exchange format and its contents • Protocol to control the exchange of electronic files
	Communication scheme	• Platform for information exchange • Characteristics of electronic communication network
Management items	• Information contained in the service delivery (catalog preparation, order entry, payment, invoice, and logistics) • Flow control scheme (purchase guideline, traceability of order flow, acceptance of goods, security) • Management of electronic documents (archive management, search, backup) • Legal liability management	

Prepared by the STFC.

1, as viewed from technical and management aspects will be required. These are broadly classified into technical arrangements and those from management considerations. The technical arrangements are further classified into two aspects: the format used for representing information, and the communication scheme.[2]

These arrangements can differ from one industrial sector to another. Therefore, an EDI implementation, if it is to be successful, calls for the enterprises in each of the industrial sectors to participate in planning a common standard. A typical example of success in early EDI introduction and subsequent evolution includes the banking sector and supermarket chains. The convenience we enjoy in inter-bank transactions using an ATM well exemplifies the results of EDI introduction. Convenience stores present another example, where information from cash desk operations is directly reflected in an EDI system. As seen above, the use of EDI has become a familiar experience in daily life.[10, 11]

Table 2 : Past international agreements regarding EDI implementation

Year	Description
1988	Formulation of EDIFACT by UN/CEFACT
1998	EDIFACT v.4 approved by ISO-9735
1999	UN/CEFACT and OASIS started developing ebXML
2004	OASIS ebXML acquired ISO-15000 accreditation
2004 -	Modification/update is being made to ebXML under the leadership of UN/CEFACT (e.g. addition of dictionary)

Prepared by the STFC.

2-3 Events leading to the move toward industry-wide common EDI standards

Although the types of forms handled by EDI may differ substantially from one industrial sector to another, the format used for representing information in communication and computers should be standardized on a cross-industrial and international basis. The common EDI standard, effective across business segments, is sometimes called a "meta-model." Standardization efforts have been made toward establishing a meta-model on an international basis.

The milestones in the history of developing international agreements for EDI are listed in Table 2. In the table, "EDIFAC1," "ISO-9735" and "ebXML" are the designations given to respective EDI standards. Each of these represents a document system that defines the details required to implement EDI, including, for example, the message exchange format described in the previous section. Of special importance, in the history of discussions toward the common standard, is the adoption of a standard generally called ebXML (Electronic Business using eXtensible Markup Language) on an international basis.

The ebXML represents a series of standards used to process inter-enterprise electronic commerce on the Internet, for which a language called XML (eXtensible Markup Language) is employed for description. The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS) jointly established the ebXML Initiative to start developing specifications, and the first edition of the major specification items was published in 2001.

The International Organization for Standardization (ISO) approved the ebXML specifications proposed by OASIS and UN/CEFACT, and published them in 2004 as a part of ISO/TS1500 ebXML.

2-4 Current status and issues surrounding EDI

The implementation of EDI in a specific business area requires, in addition to the adoption of an international standard scheme, detailed considerations and definitions on the concrete format of slips used in the area. In other words, a business-area-specific EDI is constructed on the basis of the meta-model. For example, a standard called RosettaNet has been established for the electronic parts segment.

The ebXML mentioned previously consists of multiple specifications, including "Message Service," "Business Process Specification Schemes," and "Core Components," providing a reference to define business-specific forms. Some forms are defined independently according to the commercial practice conducted in the supply chain and corporate affiliation of an enterprise.[4]

The introduction of EDI is expected to provide, by streamlining the supply chains, a huge benefit to each business sector and participating enterprise, but inter-enterprise electronic commerce has not necessarily achieved sufficiently widespread use. In the following sections, the author reviews the current state of affairs surrounding EDI, especially from technological viewpoints.

2-4-1 Current status of EDI diffusion

Among the enterprises in Japan that are affiliated with supply chains of large distributors and large manufactures, 80 to 90 percent of them have already introduced EDI. EDI usage in transactions among small- and medium-sized enterprises is much smaller, and the introduction ratio is estimated to be 10 percent or less.

A survey report published by Japan Information Processing Development Corporation (JIPDEC) in March 2010 ("A surveillance of utilization EDI/electronic tag application in Japanese industries")[3] summarizes the results of a questionnaire survey conducted on various enterprises from a wide

spectrum of industries and types of operations.

In terms of the penetration of EDI, 80.0 percent of the respondents replied that they use EDI "with some of the client companies," and 2.2 percent "with all of the client companies." EDI penetration showed a marked difference according to sales amount at a threshold of ¥1 billion. The EDI introduction ratio for enterprises with sales less than ¥1 billion was 45.9% (total of "partial" and "full" usage), but the ratio rose to 87.5% for enterprises with ¥1 billion or more in sales. A questionnaire concerning the reasons hindering EDI diffusion was made, targeting the enterprises that have not introduced EDI. The most common reason was the existence of an "established method (e.g. FAX) to communicate with business customers" (35.7%), followed by the "high cost of introduction" (28.6%), and "the lack of inter-industry standards, e.g. a standard EDI format" (25.0%). The EDI introduction ratio showed the same tendency when the sales threshold was increased to ¥2 billion and then to ¥5 billion.

The results described above show clearly that EDI penetration is higher in larger enterprises and is limited in small- and medium-sized ones. This tendency has also been pointed out by a variety of surveys and researches.

2-4-2 Multi-Terminal Phenomenon

Looking back on the past 20 years, although IT investment was strongly called for to streamline inter-enterprise business transactions, the investment for introducing a basis mechanism, typically EDI, has not necessarily been easy, especially for small- and medium-sized enterprises, due to limited financial resources. In concrete terms, the occurrence of the multi-terminal phenomenon has been one of the impediments, which causes problems including the following:

1) Because of multiple independent EDIs for contacting each business customer, the EDI operator has to switch from screen to screen (many Web browser windows).
2) EDI data is not always compatible with that of the existing in-house information system. The operator may have to re-enter the data manually.
3) The user is billed for each EDI and for each user ID.

The most important and labor-intensive process in EDI-system construction is to put a common standard in place, and to resolve the associated management problems in line with it. To the former aspect of the challenge, the widespread availability of the Internet and well-developed infrastructure for information sharing should have been a stronger tailwind for EDI, an electronic information sharing scheme. The fact of the matter, however, was that the efforts for establishing standards fell far short of the technical developments.

The Business Infrastructure Committee, set up by the Ministry of Economy, Trade and Industry (METI) in December 2008, described the situation around the problem as follows in its report issued in July 2009: "The straightforwardness of system construction promoted wide diffusion of EDI systems among many enterprises, including small- and medium-sized companies, which also prompted a proliferation of mutually-independent, incompatible standards," and "the underlying problem is that the basic mechanism of Web-EDI is most suited to remote controlling the information system of the enterprises that issue orders, and is not particularly suited to electronic data exchange, which is the bottom line of EDI."[5, 6]

As a specific example, let us review the approach taken by Company A, a midsize trading house handling mainly mechanical parts with yearly sales around ¥10 billion. As a wholesale operation, the volume of orders Company A accepts through Web-EDI from the customer retailers amounts to only 10 percent or less of Company A's total sales. On the other hand, the volume of orders Company A issues to the manufacturers using EDI amounts to nearly 50 percent of its total sales. The company uses ten types of Web-DI in daily operation. By the same token, it is normal practice for a retailer to use five to ten different types of Web-EDI. The situation described here is not specific to Company A, but represents a typical Web-EDI use within a business sector.

In many cases, enterprises introduce a Web-EDI system in response to the demand from their clients, who are larger business partners, although they know that the situation surrounding their own in-house information system does not allow overall coordination with such foreign systems, resulting in the need to set up several different EDI systems tailored on a customer-by-customer basis. This situation is what has been referred to as the multi-terminal phenomenon. In such an environment, to make a correct link to the in-house system, the operators have to work on many separate, customer-specific EDI screens/windows,

moving their attention from one terminal to another. Furthermore, EDI is generally a pay service. Because the majority of EDI users among small- and medium-sized firms have introduced it for facilitating order entry, they are charged on a flat-rate or pay-as-you-go basis. These factors constitute major obstacles hindering the widespread diffusion of EDI.

3 Possibility of EDI Innovation: The Arrival of Cloud Computing

Cloud computing is considered to trigger a significant shift to the corporate information system, both in system providers (IT vendors) and system users (enterprises).

The following changes, from the viewpoint of EDI introduction, are expected to take place:

1) Lower initial investment for IT system introduction
2) Cloud computing providing the means to coordinate EDI-to-EDI differences
3) The arrival of new operational challenges to be resolved, typically the security problem
4) The construction of an open and cloud-compatible environment.

In concrete terms, the provision of software services is expected to shift more to a through-the-network scheme, and billing will be made on a pay-as-you-go basis, as the keyword "from ownership to access" well indicates.[12] By the same token, billing for hardware (e.g. servers) will also shift to a pay-as-you-go basis. As EDI functions are actually provided to the users as a software service, these changes will have a decisive impact on the future environment for the utilization of EDI.

3-1 Changes in Japan

To promote effective utilization of EDI, demonstrative experiments are being conducted under the initiative of the Japan Electronic Data Exchange Council (JEDIC) to develop ways to construct a low-cost, cross-industrial EDI system, while taking full advantage of existing industrial-sector-specific EDI systems. One of the large-scale demonstrative experiments intends to ensure interoperability between the electronic industry and motor vehicle industry. In the experiment, each of the sectors of Japanese industries implements its own industry standard EDI in compliance with the stipulations set up by OASIS. Reports have been released on the findings of the experiment.

According to a JEDIC Newsletter,[6] JEDIC is now studying the ways to construct an IT-supported social infrastructure for informational economy, whereby a special emphasis is placed on "business infrastructure." The scheme aims at the sharing of information stepping across the bounds of individual economic transaction, which will become accessible by removing boundaries between enterprises, categories of business, and industrial sectors. In other words, the council is plotting cross-industrial EDI specifications that meet the requirements for desirable industry standard EDI, i.e. international and inter-industrial validity, and sound comprehensiveness.

Figure 2 shows a conceptual diagram of the cross-industrial EDI in the age of the cloud. Subsequent objectives for JEDIC include expanding the user basis of the cross-industrial EDI implementations, and providing such important information to industries as a common dictionary of EDI, and well-maintained and updated specifications of the cross-industrial EDI. In addition, JEDIC is geared to study the mechanism for efficient inter-enterprise information linkage in the evolving IT environment (i.e. the cloud), including standardization efforts and promotion activities for wider acceptance.

An important aspect of the information linkage mechanism is that all the information technologies to be adopted must be based on the cloud environment. According to a report titled, "Report on promotion of next generation EDI," and published by the Next Generation Electronic Commerce Promotion Council of Japan (ECOM) in March 2007, "progressive technological cross-fertilization with the next generation EDI standard technologies, including Web services (or Web API), will transform the existing mechanism for EDI function delivery into a new level of accomplishment, where bi-directional interoperability will become accessible much more easily."[20]

As an activity in Japan to ensure security in EDI, the National Institute of Information and Communications Technology (NICT) provides, in cooperation with Keio University, an authentification infrastructure that is a cloud-based application and still retains a research and development nature. Research and development activities centered on effective utilization of the cloud environment have been gaining momentum. For example, the Ministry of Internal Affairs and

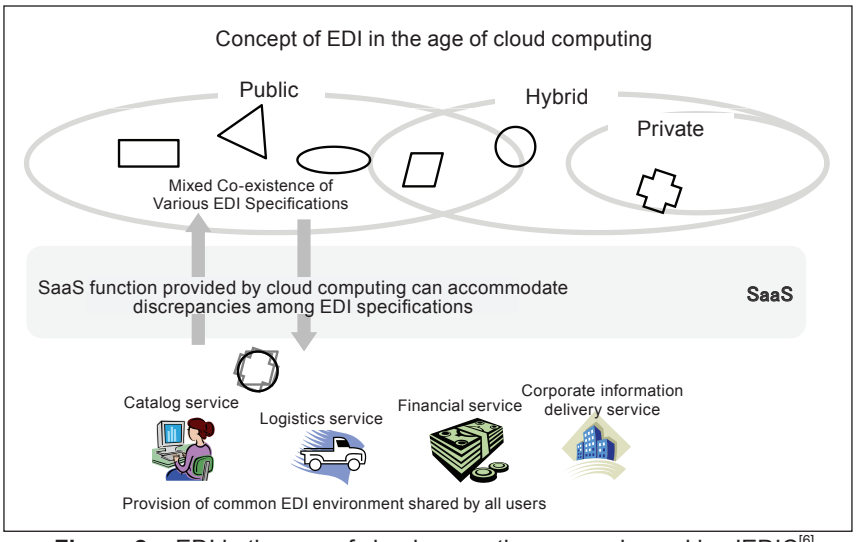

Figure 2 : EDI in the age of cloud computing: as envisaged by JEDIC[6]
Concept of EDI in the age of cloud computing

Communications (MIC) gave the go ahead, in the 2010 fiscal budget, for municipality-based test projects to ensure data interoperability in the cloud environment.

3-2 Standardization in Other Countries[22]

In many countries other than Japan, standardization efforts, typically on EDI, are being carried out by public organizations. The approaches adopted in some of the countries are described below (they are not necessarily cloud-based).

In the USA, there is a standard called ASC X12. Data transmission in compliance with ASC X12 uses the security structure defined by X12.58 (published in December 1997). ASCX 12 also allows direct use of a standard certificate based on X.509, which is issued by a certificate-issuing organization. This mechanism allows the protocol to ensure security in terms of safe electronic transactions.

Korea is regarded by OASIS as the country most active in implementing ebXML. Government-affiliated organizations, such as the Korea Institute for Electronic Commerce (KIEC), are operating agencies dedicated to electronic certificate registration, which guarantee EDI security.

In China, the China National Institute of Standardization (CNIS) is playing a leading role in efforts to establish national registry organizations so as to realize e-government. A system of metadata for common use among ministries and agencies was developed, and it came into actual use. To provide infrastructure for promoting informatization among the government organizations, a registry-based system development methodology was formulated and ordained by CNIS.

Standardization efforts of EDI in terms of metamodels are gathering momentum in China and Korea. Accordingly, the number of participants from these two countries in WG2 (metadata-related standardization) of ISO/IEC JTC1 SC32 ("Data Management and Interchange") is growing significantly in recent years, and a number of proposals for launching new sub-programs and study projects have been made.

3-3 Emergence of a new EDI that designates the cloud as its operational infrastructure

In the USA, some IT vendors have already begun to deliver software products that explicitly assume a cloud environment as the infrastructure on which EDI is operated. An IT vendor that has major players in the distribution industry in its customer list announced that it would introduce a cloud-environment-based inventory management and EDI system.[21] The system uses an independently defined standard, SuperSpec, to internally coordinate discrepancies among the varieties of existing EDIs (coordination is made on the cloud-side using the standard), and the functions required to implement EDI are delivered as SaaS (Software as a Service).

The Apache Software Foundation, the provider of Tomcat (a standard server function), is also studying similar technologies. Other undertakings include a protocol development called AMQP (Advanced Message Queuing Protocol), which is an attempt to define a standard protocol that guarantees safe and

rapid data exchange of business-related documents on the Internet. AMQP is now under review for polishing up, aiming at wide diffusion.[23]

3-4 Moves Toward Open Standards

Major cloud vendors have already delivered software products for inter-enterprise information linkage, and these have been coming into widespread use rapidly. A typical example is the supply chain management software provided by Salesforce.com. New types of cloud-based business software are not necessarily extensions of conventional EDI technology. It is of importance for the user to study what kinds of changes are brought about by cloud computing to the inter-enterprise electronic transaction schemes that have been developed on a conventional-EDI basis.

In conjunction with the offering of electronic business transaction environments from major cloud vendors, a possible problem called "lock-in" has gathered the greatest concern. If the market ascendancy of a particular vendor grows too dominant through widespread use of its electronic transaction environment, other software vendors fall into difficulties in providing their software products to the market.

To compete with the push from major cloud vendors, there is a growing voice calling for a more open standard that allows other IT vendors to engage in development efforts.

At present, major ASP businesses, such as Google, Amazon, and Salesforce.com, are providing cloud-related services to general users. Important services become available only through the use of the API (Application Programming Interface) defined independently by these major players. In the future, however, it is expected that API based on an open standard will find more widespread use in service delivery, as the ongoing efforts toward an open standard are supported by many NPOs and other organizations. The prominent view at the moment is that the situation will settle upon a loose combination of API sets that provide standardized functions and structures.[3] This trend is reflected in the active moves toward standardization, the latest information of which is summarized in the Wiki-style pages provided by Cloud Standards Coordination; at present, the activities of 14 organizations are reported. An investigative survey conducted by the Internet Engineering Task Force (IETF)—an organization aiming at promoting standardization of the Internet—pointed out a wider range of organizations, 38 in all, that could help boost the standardization efforts of the cloud environment. Each organization's major objective, scope, and track record are summarized in a report from IETF.

Figure 3 shows a conceptual diagram (a page from IETF's Web site) depicting the relations between cloud-related standards. The current scenario for the effective utilization of the cloud largely depends, as shown on the upper part of the diagram, on the services (and the associated APIs) provided by the major cloud vendors.

The desirable future utilization scenario of the environment is shown in the middle and lower part of

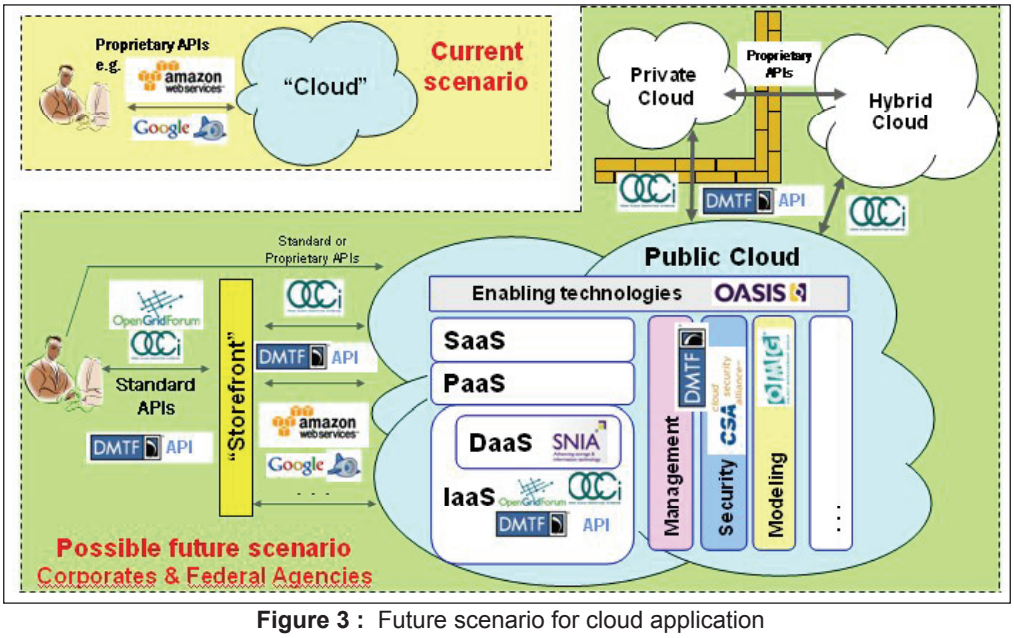

Figure 3 : Future scenario for cloud application

the figure. It is highly desirable that, with the help of the activities of standardizing organizations, the user is provided with an interface based on the common specifications defined by these organizations. In the diagram, the segment labeled "Storefront" represents the common interface that enables the standards-compliant vendors to deliver services; it is not entirely dominated by major vendors' proprietary API.

3-5 Participation from universities in the activities toward an open standard

In the USA, universities are actively concerned with establishing a cloud environment that is linked to electronic business transactions. It is generally considered that the cloud of the future will take a number of multifaceted forms, i.e. the combination of Public Clouds (the environment now widely used by such players as Google), Private Clouds (in-house environments operated by individual enterprises), and Hybrid Clouds. Under such circumstances, the types of services delivered by the providers undergo differentiation into some categories: SaaS (Software as a Service), PaaS (Platform as a Service), IaaS (Infrastructure as a Service), and DaaS (Datacenter as a Service). To ensure interoperability, standards that guarantee safe operational management and security have to be established in each of the environments.

A joint declaration regarding the future operation of the cloud ("Open Manifesto"[16]) was issued by 300 vendor-affiliated companies and US universities; they all support open standardization activities. The intended message of the declaration was to clarify that openness, and avoidance of "lock-in" by specific major vendors form the foundation for cloud evolution. In other words, the declaration intends to facilitate the transfer of data and applications from one cloud environment sponsored by a specific vendor to another environment. The declaration summarizes the common items required for a standard to be "open" (see the table below).

The Open Cloud Consortium (OCC) is a standardization organization established under the initiative of Illinois University (Chicago), with participants from academia and the private sector. The members from academia include Johns Hopkins University, Chicago University, Northwestern University, MIT (Lincoln Lab) and California Institute for Telecommunications and Information Technology (Calit2), while the members from the private sector—Cisco and Yahoo—support the project by providing relevant equipment and software development. The objective of the OCC is the standardization of technology that governs interoperability among dissimilar cloud environments, and the establishment of a framework relevant for its purpose.

Other than the organizations mentioned above, there is a variety of activities toward standardization.[17] One of the cloud computing standardization organizations in the USA, Cloud Security Alliance (CSA), released security guidance. The guidance organizes important points for ensuring security for an enterprise in making effective use of cloud services in 15 domains, including governance, law, and compliance.

In the USA, where business-academia collaboration is especially active in the IT sector, the universities are playing an important role in such standardization processes. In addition to the fact that it is easier for them to take a neutral stance in the deliberation processes for defining standards, they have the unique and importance merit of being able to present an evaluation from a purely technical point of view.

4 Recommendations

As the introduction of cloud computing into IT-system construction progresses in many enterprises,

Table 3 : Items on which standards are required in conjunction with Open Manifest[16]

Item	Overview
Security	Of special importance in the cloud environment Transparency is required on the service-provider side
Data and Application Interoperability	A standardized interface is essential. The environment must be independent from the infrastructure and platform
Data and Application Portability	Interoperability is a must when the enterprise information system is subcontracted to an external agent
Governance and Management	Consideration of a cloud-specific operation scheme is required when subcontracting (e.g. system life-cycle management)
Metering and Monitoring	A consistent performance-evaluation metric is required: services from more than one cloud vendors may be used.

Prepared by the STFC.

the implementation cost for EDI may well become lower and lower. Much standardization effort is currently being made on the premise of widespread use of the cloud, and the standardization of EDI in a cloud environment is one of the key objectives in this trend. Some of the issues to be considered in conjunction with the EDI in the cloud age are as follows:

- Provision of common (ideal) EDI-compatible software for mission-critical tasks.
- Lowering of (initial) cost for EDI introduction
- Flexibility of EDI and the software running on it, capable of agile response to changes in the business environment of the enterprise
- Ease of participation in the EDI promoted by an industry group

When looking at the manufacturing-related industries, including the distribution sector, more than 90 percent of enterprises in Japan, such as trading firms, belong to the category of small and medium-sized enterprises. Problems, symbolized by the multi-terminal phenomenon described in 2-4-2, are taking place in such small and medium-sized enterprises. Therefore, in addition to the heretofore mainstream EDI systems, or those led by large companies, one of the future challenges is to introduce a new breed of EDI systems endorsed by the industry groups of small and medium-sized enterprises, in such a way that they fit well with the cloud environment.

From the viewpoint of software developers and vendors, cloud computing is expected to provide an innovation that enhances productivity significantly.[24] The cloud-based environment allows the relatively easy deployment of server-type applications, e.g. an EDI system. In another development, the progressively widespread use of handheld terminals may trigger a drastic change in the conventional enterprise information systems. In this way, cloud computing provides new opportunities for innovation in the software-provider side as well.

It is a generally accepted view that the small and medium-sized IT vendors in Japan are weaker in terms of market competitiveness than larger players. As already pointed out by the statistics and reports from Japan Information Technology Services Industry Association (JISA), this problem can basically be ascribed to a multiple-hierarchical subcontracting. Wide diffusion of cloud computing could provide such small and medium-sized IT vendors with a chance to breakthrough into a new environment, enabling them to deliver important software products that support inter-enterprise electronic transaction.

The major cloud vendors at present are U.S.-capitalized large enterprises. Therefore, it is of special significance in Japan, especially in research activities at universities, to explore the possibilities of cloud-environment construction based on an open standardization.

Firstly, support for the diffusion of an open standard is important to ward off lock-in by a specific vendor. Along these lines, the research and development efforts must keep an eye on the new modality of EDI and electronic transactions, assuming the prevalence of the cloud environment, in which the matter of consequence is collaboration between the two groups of those involved: EDI users in small and medium-sized enterprises, and IT vendors that provide solutions for EDI and electronic transactions. In concrete terms, the accumulation of use cases, where the standard to be developed shell be applied, is important for facilitating standardization activities.

For example, the Distributed Management Task Force (DMTF)—one of the standardization organizations advocating open standards—has reported on nearly 20 of the practical research and development case studies around the world (e.g. U.K.) in the past two years. These kinds of feasibility studies can provide beneficial research materials for the practical application of business science and information technology.[20]

Even in EDI alone, academic-industrial collaboration, between a university and an individual industry group, could prove productive, whereby the university can provide a platform for experiments. The effort toward standardization based on the cloud environment is an ongoing process: the approach for the research should be reviewed and modified without delay in response to the changes in this trend.

Acknowledgement

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References

[1] The Distribution Systems Research Institute (DSRI), "Knowledge of EDI," Nikkei Inc, Jan. 2008

[2] Mostafa Hashem Sherif, "Standardization of Business-To-Business Electronic Exchanges," IEEE, Standardization and Innovation in Information Technology: SIIT 2007 Proceedings, 2007

[3] Japan Information Processing Development Corporation (JIPDEC), "A surveillance of utilization /electronic tag application in Japanese industries," March 2010

[4] Information Processing Meeting for the Study between the Screw Companies, "EDI for N-Ken.Net," Feb. 2010

[5] Next Generation Electronic Commerce Promotion Council of Japan (ECOM), "Report of an investigative survey on establishment of industry standard EDI," March 2010 http://www.jipdec.or.jp/archives/ecom/results/h21seika/H21results-11.pdf

[6] Next Generation Electronic Commerce Promotion Council of Japan (ECOM) & Japan Electronic Data Interchange Council (JEDIC), "State of Things in Industry Standard EDI," May 2009 http://www.jpca.or.jp/cedi/Forum/13.0905/1.JEDIC.pdf

[7] JEDIC Newsletter No.98

[8] Japan Electronic Data Interchange Council (JEDIC), "Recent trend in business infrastructure construction for inter-enterprise information linkage: Strategy transcends industry/nation boundaries," May 2010

[9] http://www.jpca.or.jp/cedi/Forum/15.1005/2.jedic.pdf

[10] Project X, "Come-from-behind victory: a group of laymen outsmarts the US convenience chain," NHK publishing, March 2001

[11] Susumu Ogawa, "Origin and principle of innovation," Chikura Publishing, Jan. 2001

[12] Tamotsu Harada, "Digital distribution strategy," Doyukan Inc., Nov. 1997

[13] Toshiaki Kurokawa, Kazuyoshi Hidaka, "Promise of Cloud Computing: Underlying Technology That Supports Transformation from Possession to Utilization," Science & Technology Trends No.111, National Institute of Science and Technology Policy (an affiliate of MEXT), Jun. 2010

[14] Akihiro Fujii, "Expanding Use of Web API—Vast Potential of Mash-up—," Science & Technology Trends No.106, National Institute of Science and Technology Policy (an affiliate of MEXT), Jan. 2010

[15] "Cloud standards positioning": http://cloud-standards.org/wiki/index.php?title=File:Cloud_standadrds_positioning_v4.jpg#filehistory

[16] Open Manifesto: http://www.opencloudmanifesto.org/Open%20Cloud%20Manifesto.pdf

[17] "Results of Clouds SDO Survey," IETE, Jun. 2010 http://www.ietf.org/mail-archive/web/clouds/current/pdfkrmoPVEfqP.pdf

[18] OGF: http://www.gridforum.org/

[19] SNIA: http://www.snia.org/

[20] DMTF: http://www.dmtf.org/

[21] Next Generation Electronic Commerce Promotion Council of Japan (ECOM): http://www.ecom.or.jp/

[22] "GCommerce," A case study of Mirosoft Corporation, Dec. 2010 http://www.microsoft.com/casestudies/

[23] Apache Qpid project, Inter-enterprise messaging, http://qpid.apache.org/

[24] Krikos, Alexis Christopher, a MIT master's thesis, "Disruptive technology business models in cloud computing," http://dspace.mit.edu/handle/1721.1/59255

Profile

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