

From EDI to UN/CEFACT: An Evolutionary Path Towards a Next Generation e-Business Framework

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Abstract

Modern e-Business frameworks have evolved from traditional EDI technology. The evolutionary development towards current e-Business stacks like RosettaNet led to an increased degree of integration and operational efficiency. Nevertheless, significant shortcomings still exist. Especially on the semantic level of data and process engineering further improvements are expected to harmonize the diversity and redundancy of existing e-Business stacks. UN/CEFACT's standardization efforts are a promising solution towards next generation e-Business frameworks. The authors intend to provide a picture of the future of e-Commerce by evaluating three cornerstones of e-Business standard evolution: EDI, RosettaNet and a novel combination of specifications issued by UN/CEFACT.

Keywords: UN/CEFACT, CCTS, RosettaNet, process and data engineering, EDIFACT

1. Introduction

Since the introduction of EDI in the late 1960s, e-Business standards went through an evolutionary path from monolithic, proprietary and inflexible standards towards modern e-Business stacks covering a broad set of business requirements [1]. Especially the emergence of various XML based data standards promised to solve the main drawbacks of traditional EDI-based technologies like very specific expert knowledge, nonflexibility, expensiveness and complexity [2]. The imagination of XML to become the key to solve these issues turned out to be wrong. Instead, the numerous XML based languages that have emerged during the last years even increased the complexity inherent to Enterprise Application Integration (EAI) and data mapping [3]. One of the major reasons for the deficiencies of state-of-the-art e-Business frameworks is the lack of efficient semantic integration. A way out of the described business

standards dilemma can be seen in the next stage of the evolutionary path of e-Business stacks. To formally describe and integrate aspects of semantics and context on both the process and the data level into a comprehensive stack, the specifications of the UN/CEFACT organization are the most promising solution to solve this dilemma.

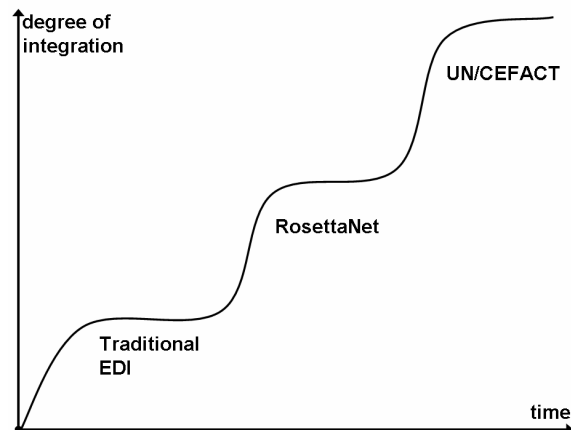


Figure 1-1 Evolution of e-Business stacks

Figure 1-1 demonstrates this evolutionary path from traditional EDI technologies, current approaches like RosettaNet towards the next generation of e-Business stacks as the one envisioned by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). The term degree of integration that is used to evaluate the different standards comprises technical, semantic and process-related aspects of enterprise interoperability.

In this work, we will provide a detailed picture of the advantages and drawbacks of existing e-Business standards and elaborate on a future “living” platform that is composed of the different UN/CEFACT specifications. This platform has not yet been completed by standardization bodies and thus is still subject to changes. The purpose of our contribution is to draw a picture of this upcoming, novel e-Business framework that has the potential to revolutionize both modeling and operation of e-Business processes worldwide.

The remainder of the paper is organized as follows: In Chapter 2, the three abovementioned stacks are presented. Chapter 3 comprises both the introduction of major evaluation criteria and the application of those criteria with regard to the e-Business architectures. Chapter 4 summarizes the critical findings, where Chapter 5 outlines related research work.

2. E-business stacks under examination

The authors have chosen the following three e-Business stacks for the evaluation. Traditional EDI technology has evolved in the 1960s with several data standards, of which UN/EDIFACT is the most successful and international accepted standard in this area. RosettaNet is selected as a representative for a state-of-the-art XML based e-Business framework. To depict a view on a possible e-Business stack of the future, the standards and specifications of the UN/CEFACT will be presented.

2.1 Traditional EDI/ EDIFACT

The history of e-Business began in the 1960s when companies tried to automate business processes and transactions to reduce processing delays and inefficiencies associated with manual processes. Electronic Data Interchange (EDI) technology has been developed and deployed to prevent human intervention in processing business information [1] and aims at the definition of message structures. Diverse EDI solutions have emerged, which all have their own representation syntax (e.g. TRADACOMS, SEDAS, VDA, ODETTE, ANSI X.12). These initiatives turned out to be not helpful for cross-industry e-Business, because the representation of semantics and information is too different. The result was the development of an international accepted cross-industry standard under the flag of United Nations. The United Nations Electronic Data Interchange For Administration, Commerce and Transport (UN/EDIFACT) standard [4] has become crucial to nearly every industry including retail, healthcare, financial and automotive.

EDIFACT messages are not based on Extensible Markup Language (XML) syntax and do not consider human-readable tags. Instead, they consist of a sequence of ASCII-coded segments, data element groups, data elements and values that are separated and structured by symbols such as colons, semicolons and apostrophes. These symbols are also utilized to realize a hierarchical structuring of the messages, which comprise IDs for sender and receiver, payload data, time stamps and check codes. An envelope represents the frame for each EDIFACT compliant message.

Besides the message definition, the EDIFACT stack includes directories and subsets [5]. Directories are used for versioning and maintenance purposes. Due to the complexity and diversity of the EDIFACT messages, so-called subsets are used to structure and define sets of EDIFACT messages to cover the requirements of a specific industry.

2.2 RosettaNet

Since the release of XML in 1998, many initiatives preferred XML to UN/EDIFACT as a more adequate foundation for building e-Business frameworks. Major advantages of XML were the immediate and readable consideration of their business semantics by the human-readable tags, and the huge amount of available tools for schema development, mapping, and integration. In [6] and [7], the characteristics of the so called RosettaNet standard are presented in detail. The basic standard encompasses certain dictionaries, an implementation framework, XML-based business message schemas and process specifications, which will be briefly explained in the following: The so-called Partner Interface Processes (PIPs) represent the heart of this standard as they specify the business process alignment (XML-based dialogs) between trading partners. PIPs thereby specify both the structure of the business documents to be exchanged during a business process and also the message choreography (sequence) in which they are sent between the different roles. Seven functional clusters have been defined of which each comprises different PIPs covering major parts of the supply-chain [8]. The idea behind this clustering was that trading partners within one of these groups have similar business needs with regard to business processes and corresponding documents exchanged. The RosettaNet Implementation Framework (RNIF) provides exchange protocols, message structure, security mechanisms and more for the implementation of RosettaNet PIPs. To reduce confusion in processes due to each company's uniquely defined terminology, the RosettaNet consortium also provided common vocabularies for conducting e-Business. We will describe these dictionaries and the resulting implications for our comparison in the sections below.

2.3 UN/CEFACT

UN/CEFACT desires to close the semantic gap in B2B which has emerged from a non-controlled definition of business libraries and the contempt of rules for describing semantics in a common way. The characteristics of the upcoming UN/CEFACT stack [9] we consider in this work (please see Figure 3-1 on page 6) consists of ten major components,

which will be briefly listed and explained in the following:

CCL & CCTS. First, the Core Component Library represents the repository for the generic, Core Component Technical Specification (CCTS) [10] based business information. The CCTS is the methodology for building business information on a syntax independent level, which is the second building block of the UN/CEFACT stack. In the area of e-Business, CCTS is designed to tackle the lack of cross-organizational interoperability between different applications on a data level. Instead of focusing on inflexible and pre-determined business message definitions, CCTS provides mechanisms for the efficient use of semantic building blocks that are syntax agnostic and represent the general business data entities which are commonly used in today's business processes. With the help of those blocks that are stored in the Core Component Library, even new business vocabulary can be dynamically created and is still interpreted correctly by all users. Figure 2-1 depicts the basic principle of assembling business documents of core components that are stored in a common library.

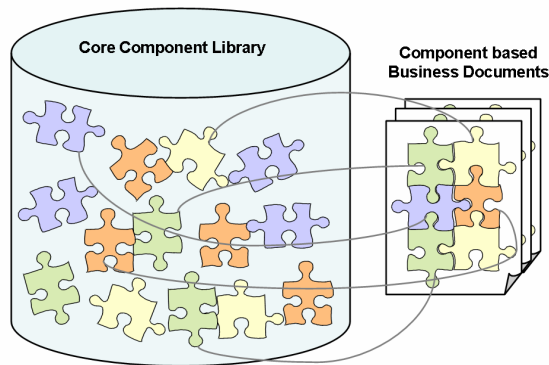


Figure 2-1: Dynamic Business document assembly of basic data building blocks (core components)

UMM. The so-called UN/CEFACT Modeling Methodology (UMM) [11], the third major composite of the e-Business framework presented in this paper provides a basis for modeling business processes in an efficient fashion that also facilitates reuse. It features a set of pre-defined process stereotypes, tagged values and constraints that enable rapid assembly of whole business processes. UMM is limited to modeling within the semantic, technology- and syntax-independent layer.

BCSS. As an a fourth part, the Business Collaboration Schema Specification (BCSS) provides an UML based representation of the CCTS rules and artifacts [12].

CDM. As a fifth component of the future UN/CEFACT e-Business stack, the Context Driven Methodology (CDM) will represent a novel and unique possibility to adapt generic business data core

components to the current users' contexts. In this way, only the data parts that are of high relevance for the users are pre-selected for data modeling purposes. This dynamic, context-driven adaptation and restriction of core components will be a valuable part of this e-Business framework. First concepts of this approach can be studied in [3].

BMA. Sixth, the Business Message Assembly (BMA) specification is regarded as an important approach for assembling higher level business information for complete, electronic messages. By defining one standard for the composition of business messages, enterprise interoperability is facilitated. Both the previously explained CDM and the BMA have not yet been completed by UN/CEFACT so far.

SBDH. The Standard Business Document Header (SBDH) specification works as the seventh composite of the stack and supports the determination of application based logical routing requirements of business information.

CDT. Eighth, the Core Data Type (CDT) standard defines the smallest and generic (without any semantic meaning) pieces of information in a business data model with relevant characteristics. In this way, UN/CEFACT has created an unambiguous basis of atomic business information parts that are used to assemble all higher level parts up to a complete business document according to the rules of CCTS and BMA.

NDR. Ninth, the Naming and Design Rules (NDR) defines a set of rules for transforming CCTS based artifacts into XML Schema and XML based instances.

XML Schema. The syntax-specific standards Schema for CDT, XML as well as the XML Schema represent the tenth and last part of the UN/CEFACT e-Business stack. UN/CEFACT does not prescribe users to use a specific technology platform for implementation purpose. One exemplary e-Business framework that leverages UN/CEFACT standards is ebXML [13]. It offers a concrete specification regarding overall architecture and implementation framework, choreography languages (BPSS) and modeling methodology (UMM).

3. Comparison of the stacks

3.1 Evaluation criteria

For a sound scientific benchmark of these three frameworks it is essential to define appropriate benchmark criteria. The ones relevant for the work on hand are introduced in this section of the paper.

Horizontal and Global Integration. Horizontal and Global Integration describes the fact that the stack is not sector-specific but can be applied to a variety of different industries. It represents an

important factor for a worldwide dissemination and enhanced interoperability.

Flexibility. In close connection to the before-mentioned criterion, flexibility of implementation means that the standard can be adapted and extended according to the needs of multiple enterprises and are able to incorporate new business requirements in a timely manner.

Maturity. The maturity of standards depicts whether the standard is still “under construction” meaning that the development of the standard is still under way. In this case, further components are being added constantly in order to increase the number of areas covered by the standard.

Common Repository/Dictionary. Common Repositories fulfill the requirement of a “lingua franca”, i.e. an upper ontology for conducting e-Business. This guarantees a proper understanding between interacting business partners and their underlying enterprise applications.

Comprehensiveness of the Stack. With this characteristic we express the significance of the stack to cover integration issues on all relevant levels (e.g., syntax, semantics, processes). In terms of framework comprehensiveness, one has to keep in mind that with an elevated comprehensiveness the complexity increases as well which leads us directly to the following item.

Ease of Implementation and Operation. This criterion reflects the necessity of being able to adopt standards with bearable efforts, especially regarding financial investment. Particularly for SMEs (small and medium-sized enterprises) this constitutes a key obstacle for implementing certain standards. Operational efficiency concerns the efforts and time required for maintaining and also adapting a framework.

Degree and Potential for Dissemination. Concerning this last criterion we have to differentiate between the current dissemination and the probable spread in the future. As the former might just be a result of a long-standing, traditional utilization of an obsolete standard, the latter transcends the simple reflection of the status quo and emphasizes the potential of standards.

3.2 Application of the criteria

Traditional EDI/ EDIFACT. Although there were several approaches (like UN/EDIFACT) to consolidate the existing multitude of EDI-standards, industry-specific formats still dominate nowadays because of complexity reasons. This impedes a desired **horizontal integration** with the possibility of intersectoral B2B relationships.

In [7], several reasons are identified that represent significant hurdles to the broad adoption of EDI standards: First, the **implementation and operation**

of an individual interface between the often proprietary company IT systems and an EDI-compliant messaging infrastructure is expensive. Especially on the analysis of the data semantics and interface development, high efforts are required. Only out-of-the-box solutions (middleware and mapping systems) are available. Particularly small and medium size enterprises (SMEs) neither have the financial means nor the capabilities to build a solution on their own [14]. Second, new business requirements cannot be incorporated by the standard **flexibly** since the standardization bodies’ internal processes only work slowly. Last, the actual deployment of an EDI-based solution introduces its own maintenance and administrative overhead.

The great number of institutions and individuals that have participated in the development of this standard (of which each has specific business needs) has lead to a huge complexity of the EDIFACT standard messages which is not supported by a **common repository**; often, they are overloaded with features that are not required by many users and hard to implement.

The implementation of EDIFACT-based data exchange has turned out to be very costly due to the proprietary syntax which is neither readable for human beings nor displayable by conventional web browsers. As opposed to EDIFACT, XML-based data can easily be transformed (e.g., with the help of XSLT) to structured means for visualization. However, large investments have been made to design and deploy EDIFACT messaging systems in a variety of industries, leading to a high degree of **dissemination**. Thus, many firms will seek solutions for remaining with the message content and structure as defined by the EDIFACT specification due to its **maturity** and broad acceptance. Since there is growing need for XML based e-Business solutions with a higher **comprehensiveness of the stack**, these firms think about deploying XML adapters that are capable of translating back and forth between XML and EDIFACT compliant business data (e.g., [15]).

RosettaNet. As RosettaNet has a strong focus on collaboration processes, their early sponsors chose to first define business processes in detail rather than jumping into defining XML messages. The intention is to overcome the traditional one-to-one relationship in business processes, e.g. using EDIFACT, and to develop plug-and-play interoperability between trading partners [7]. Other deficiencies that RosettaNet is trying to surmount are the standardization on a semantic and process level as well as a real-time, business-to-business information exchange. These efforts are backed up by research projects which concentrate on “horizontalisation” of the framework.

RosettaNet is typically classified as a vertical standard [7], focusing on the needs of specific industries. Therefore, the standard still lacks the potential for **horizontal integration**, despite its convergence with ebXML that makes it adoptable by a variety of industries. At the same time several industries, like the Chemical and the Petroleum Industry [16], are trying to profit from the successes RosettaNet had in the high-tech sector and to implement the standard, thus, increasing gradually its horizontal applicability.

Even though the specification of the respective PIPs as well as their implementation can be estimated as rather rigorous, the standard features elements for enhancing **flexibility**. As each PIP defines just relatively simple process steps, companies can combine those process components and map whole processes according to their own requirements. Furthermore, company-specific problems can be broached in the so-called “Milestone Programs” where individual solutions are being developed. These individual solutions can then be used by other enterprises within the community and evolve into a standardized business process if a sufficient number of partners have successfully implemented the process. This validation process is rather protracted, reducing the flexibility of RosettaNet considerably, particularly in comparison to the incorporation of new core components within CCTS and UN/CEFACT.

At the same time the standard’s architecture is improved technically. A current example is the Multiple Messaging Services initiative aimed at extending the current RNIF specifications to support Web Services-based exchanges as well. Hence, the RosettaNet standard is permanently **maturing** and enlarging potential areas of application. For achieving solid results and acceptance an incremental approach is chosen that avoids attempts to “boil the ocean”.

The RosettaNet standard guarantees a uniform definition of the components on three crucial levels for e-Business [16]:

- the technical or syntactical level, by specifying the message format, the transmission protocol as well as security and encryption issues by means of the RNIF,
- the process level as the PIPs allow to define open business process dialogs by establishing a sequence of messages, time limits, appropriate responses and so on,
- the semantic level, by providing a common terminology with the help of its dictionaries (especially regarding Business Data Entities and Properties and Fundamental Business Data Elements) that enable the specification of variable business messages by combining common building blocks.

The **comprehensiveness** of the RosettaNet stack which allows not only to define messages but the whole process flow represents one of its major advantages.

The trade-off for this comprehensiveness normally consists of an increased complexity for implementing a standard. However, the **implementation** is facilitated by the associated Recommended Implementation Guide (RIG) and the Trading Partner Implementation Requirements (TPIR-PIPs). Within the RAE-initiative (RosettaNet Automated Enablement) these TPIR-PIPs intend to enable a less cost and time intensive implementation, especially aimed at integrating SMEs [17]. Various XML editors can be used in order to constrain and customize schema-based PIPs to the company’s requirements without any manual adjustment procedures.

Rosetta originally emanates from the high-tech industry as a vertical standard limiting its horizontal **dissemination**. Nevertheless, it has proven capable in several other branches in the past years. By 2001 there have already been more than 600 implementations worldwide including 30 big companies like Avnet, Cisco, Federal Express, Fujitsu, HP, IBM, Intel, LG Electronics, Nokia, Siemens und Texas Instruments. And there is a growing number joining this community as the example of Intel who is currently replacing EDI with RosettaNet standards. With an overall turnover of more than € 1 trillion of the companies using RosettaNet, it constitutes – behind EDI – by far the supply chain standard with the widest dissemination [18]. Moreover, studies show that there is an increasing effort in other industries (like retail and engineering) to implement this standard [19]. For the future a further dissemination of the standard, particularly on an international scale, seems likely as the RosettaNet Consortium gained further support by the well established UCC (Uniform Code Council) which it became part of in August 2002.

UN/CEFACT. In Figure 3-1, the three stacks that are investigated in this work are depicted. First of all, the monolithic and inflexible character of the EDI stack can be seen. There is only one single specification that spans over almost all parts of the e-Business stack. Only in terms of the implementation framework, users have different options available. RosettaNet provides flexibility to some extent (Dictionaries and MMS can optionally be used and exist as separate standards), where UN/CEFACT does not intend to prescribe the utilization of only one holistic approach, but offers several alternatives to the users. The acronyms CCL, UMM, CCTS, BCSS, CDM, BMA, SBDH, CDT and the Naming and Design Rules (NDR) have been explained in section 2.4. As can be seen in this figure,

UN/EDFACT allows for using several different standards for technical implementation (e.g., ebXML) and the syntax (e.g., Universal Business Language, UBL) to be used.

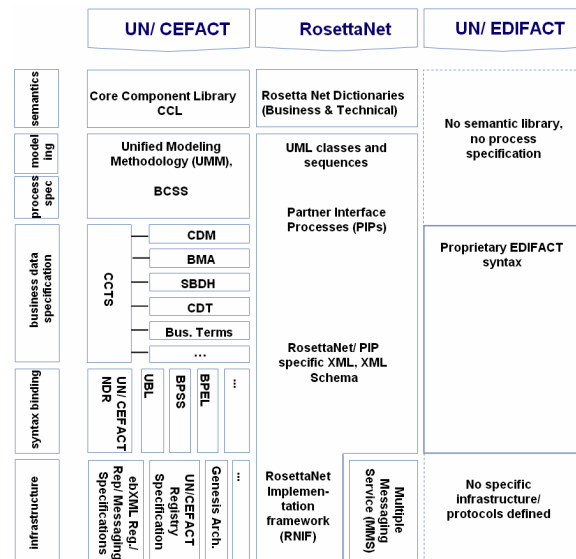


Figure 3-1: Comparison of the three e-Business stacks

One of the greatest strengths of the UN/CEFACT e-Business stack as proposed by the authors is its horizontal integration of all possible industries. As opposed to RosettaNet which focus on vertical solutions to a larger extent, there is no limited and static set of documents and processes. In fact, the UN/CEFACT Core Components Library and the related CCTS will offer a fundamental vocabulary that is adequate to model even arbitrary business information where UMM allows for extremely flexible and syntax-independent modeling of business processes from a set of different business perspectives [9]. One more feature emphasizes this point: The UN/CEFACT specification does not only foresee an upper ontology that encompasses a set of numerous core components, but also so-called business terms that are used to translate the core components into all the different industry-specific terminology domains. As a simple example, a person's name could be presented to the user as surname or family name, depending on the context he is in. The different business terms are expected to increase the rate of core component retrieval, reuse and, thus, the efficiency of the whole UN/CEFACT e-Business stack.

Of the three standards presented in this work, the UN/CEFACT stack provides users the highest **flexibility** in terms of adaptability to new business requirements. In contrast to UN/EDIFACT, where only a limited and static set of messages has been made available, UN/CEFACT aims at a "living" platform that is accessible to all users and grows over time. Users are expected to model their business data on the basis of the core components that already

have been defined and to create and publish new ones in case no proper core components exist. This approach will be amended by methodologies for harmonizing newly published core components to ensure scalability of the envisioned library. The RosettaNet consortium currently evaluates the utilization of the UN/CEFACT CCTS approach for modeling their future business information libraries. In this way, RosettaNet desires to allow for a more flexible data modeling approach and works as an indicator for the e-Business evolution towards the UN/CEFACT stack.

Significant parts of the UN/CEFACT e-Business stack are **mature** and are readily available to users (e.g., CCTS). Several other parts have not yet been finished, however. For example, specifications related to Business Message Assembly (BMA) and the Context Driven Methodology (CDM) are currently being worked on [9]. An explicit time horizon for the completion of these specifications does not yet exist. Since the UN/CEFACT stack is based on an evolutionary, extensible and modular architecture, a continuous development of single standards is not an issue.

All core components defined by UN/CEFACT are envisioned to be stored in **one single common repository** that is freely accessible by all users. As opposed to the static repositories existing in the case of EDIFACT and RosettaNet, the UN/CEFACT repository will be highly dynamic and extendible and will feature efficient methods for quickly identifying core components that match the respective users' contexts. The biggest challenge inherent to this open platform is to ensure scalability also in case of a large number of users. A completely unrestricted publishing of new component-based business documents would most likely result in a repository that is overloaded with partly redundant, not harmonized data. Thus, methodologies must be developed that take into account this issue and ensure data consistency in compliance with CCTS and to minimize the number of actually redundant core components.

In terms of **comprehensiveness**, the UN/CEFACT stack does not intend to provide recommendations or specifications for all layers of the OSI [20] reference model. First of all, it mainly tries to approach the Business Operations View (BOV), but not the Functional Service View (FSV) as defined in [21]. This means that no recommendations will be issued on how to implement messaging protocols, which communication standards to use and how to approach security questions. In this respect, RosettaNet (with the RNIF) spans a greater part of the e-Business stack than UN/CEFACT does. UN/CEFACT does not intend to offer one single e-Business solution that spans over the whole

communication stack but mainly focuses on the BOV. For implementation purposes, several existing standards can be utilized.

Ease of implementation and operation is a crucial criterion for evaluating e-Business solutions. Large financial upfront investments represent adoption obstacles especially for SMEs due to their limited capacities. The implementation of an e-Business solution that leverages the UN/CEFACT standards cannot be expected to be built by small or medium size businesses on their own. Especially due to its focus on the BOV layer, users clearly need guidance with regard to the concrete technical platform that can be used to realize a UN/CEFACT compliant solution.

In terms of operational efficiency, an UN/CEFACT based framework has the potential to strongly increase the degree of automation in e-Business processing. The collaborative and evolutionary character of the envisioned central Core Component Library and a context-guided retrieval and reuse functionality will simplify the process of defining and establishing business transactions between trading partners. One important question is: How will the agreements on common business documents or business process specifications work between partners that have different formal requirements or business needs? Are additional trading partner agreements necessary that cannot be processed automatically? Such additional agreements may be inevitable if there is no proper Core Component existing that fulfills all needs of the trading partners. Consider two firms that desire to exchange purchase order document, for example: If the purchase order recommendation that is provided by UN/CEFACT does not take into account all business requirements of these trading partners, they will have to work on extensions that are compliant with the common methodology (CCTS) and that are only to be considered in their context. After the definition, these context-specific extensions can then be submitted back to the UN/CEFACT repository for harmonization reasons and can also later be leveraged by other users afterwards. Summing up, the UN/CEFACT specification (as well as all other existing e-Business standards) is not able to completely avoid extra trading partner agreements, but the new CCTS approach provides a democratic and evolutionary platform that grows over lifetime and thus reduces the need for additional agreements to a minimum.

The **degree of dissemination** of UN/CEFACT compliant e-Business solutions is still small compared to standards such as UN/EDIFACT. The **future potential** of this stack, however, is enormous: As UN/CEFACT proposes an e-Business stack that mainly concerns the Business Object View and leaves implementation issues up to the users,

diverse platforms and technologies can be leveraged for performing business transactions over the web. This enables software manufacturers to offer their unique products which are still interoperable since they are based on the same semantic basis.

The collaborative and evolutionary characteristic of the standard offers the highest potential to facilitate adoption among enterprises. Not a central entity defines the semantics and structure of business documents or the process choreography, but the users themselves have the chance to define and publish the models that fit their needs best.

4. Conclusion and Outlook

In Table 4-1, the results of the preceding e-Business stack comparison are depicted. Conventional EDI Technology, except from the criteria of maturity, obviously stays back behind the other frameworks. The comparison between RosettaNet and UN/CEFACT is more complex: RosettaNet on the one hand, definitely scores higher on maturity and comprehensiveness of the stack as well as regarding the current degree of dissemination.

	EDIFACT	RosettaNet	UN/CEFACT
horizontal integration	✓	✓	✓✓
flexibility		✓✓	✓✓✓
maturity	✓✓✓	✓✓	✓
common repository/dictionary	✓	✓✓	✓✓✓
comprehensiveness of stack		✓✓✓	✓✓
ease of implementation		✓	✓✓
degree of dissemination	✓✓	✓	

Table 4-1 Results of the evaluation

This is due to the fact that some of the UN/CEFACT specifications are not finalized yet. Moreover, RosettaNet offers a solution that spans the whole communication stack and, as opposed to UN/CEFACT, defines a technical framework for implementation. The most relevant advantage of the UN/CEFACT e-Business stack over its competitors is its capability to dynamically incorporate and adapt to individual user needs instead of providing a limited and pre-defined set of data and process descriptions. In the context of UN/CEFACT, both business data and processes can be assembled of basic building blocks that either already exist or are created and published by the users themselves during the modeling process. The main goal of UN/CEFACT is to establish sustainable business content which can be used by different technical frameworks. For this reason, it scores higher than its alternative architectures, especially in the fields of horizontal integration, flexibility and the capabilities

of the common repository. As a consequence, we estimate the future dissemination potential of UN/CEFACT very high as well.

Further potential for improving the score with regard to the evaluation criteria and, hence, increasing B2B-integration between partners lies in the convergence of vertical and horizontal standards. Instead of trying to replace existing standards, a common approach is preferable eliminating the deficiencies of the respective e-Business stacks.

5. Related Work

Researchers at the University of Vienna [22] have been involved in defining and extending specifications and components that amend the upcoming UN/CEFACT e-Business framework. An Add-In for the UMM specification, for example, realizes the automatic generation of executable BPEL code out of UMM compliant graphical models.

In May 2004 the European Commission decided to support a center of excellence (Enterprise Interoperability Center, EIC) [23] that is devoted to fostering enterprise interoperability worldwide.

The two EU-funded projects GENESIS [24] and ITAIDE [25] deal with next generation e-Business frameworks as well.

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