Catalog of Electronic Invoice Technical Standards in the U.S.

Business Payments Coalition

Federal Reserve Bank

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Introduction

The purpose of the *Catalog of Electronic Invoice Technical Standards in the U.S.* is to lay the foundation for the U.S. market on selecting an invoice standard to accelerate the adoption of electronic invoicing by U.S. businesses. As this document presents, a large number of electronic invoice technical standards exist in the U.S. market, resulting in a fragmented market and interoperability[1] challenges among the standards. This impacts U.S. businesses negatively by driving up the complexity and operating costs involved in sending and receiving electronic invoices.

Background

The concept of electronic invoicing has been around since the early 1970s with the introduction of Electronic Data Interchange (EDI) that allowed trading partners to exchange transactional information for procurement, payment, and settlement. At the time, EDI was implemented primarily by large corporations and government entities due to the high complexity and technical integration hurdles.

With the emergence of the web browser and commercialization of the internet in the 1990s, coupled with new ways to express data, an expansion of electronic invoice syntaxes became possible.

Today, over 250[2] e-invoice service providers[3] operate in the U.S. market. They create, send, and receive more than 15 different e-invoice formats[4] and 40+ different subsets, creating a complex and diverse environment for electronic invoicing in the U.S.

This diversity of options creates a major barrier to adoption for U.S. businesses. The lack of interoperability between the differing syntaxes[5], formats, and subsets and the various service providers and systems creates headaches for end users. Often times, U.S. businesses interested in electronic invoicing are required to integrate directly with their trading partner's system or join a network to which their trading partner belongs, resulting in additional cost burdens to the business. Understanding the diversity of the U.S. marketplace helps identify the challenges market participants face related to interoperability, integration, and adoption and will help identify a unifying, open e-invoicing technical standard that spans all sizes of businesses and all industry segments.

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[1] See Definition of Terms in the Appendix
[2] Billentis, 2017 E-Invoicing / E-Billing Report
[3] The term Service Providers is used to describe the vendors who offer ERP Systems, Invoice / Billing Software, Accounting Software, Document Management Systems, Workflow Systems, Office Software, and Network Providers.
[4] See Definition of Terms in the Appendix
[5] See Definition of Terms in the Appendix

Before an e-invoice technical standard can be established, as called out in the *U.S. Adoption of Electronic Invoicing: Challenges and Opportunities* whitepaper,[6] there is a need to catalog the current electronic invoice (e-invoice) technical standards in use by U.S. businesses to understand the major obstacles that exist in the current business environment. In response to the whitepaper, the Business Payments Coalition[7] convened an E-Invoicing Work Group to accomplish this task. This paper is the result of the effort by the Work Group.

Business Payments Coalition & E-Invoicing Work Group

The Business Payments Coalition consists of organizations and individuals working together to promote greater use of electronic B2B payments and remittance data exchanges, as well as other ways to increase B2B transaction efficiency across the Procure-to-Pay (P2P) and Order-to-Cash (O2C) processes. A subset of members formed the E-Invoicing Work Group.

The Work Group is made up of 35 members who represent a cross section of U.S. businesses and organizations servicing the U.S. market focused on solving e-invoicing problems in the O2C and P2P business process. To accomplish this, the mission of the E-Invoicing Work Group is to explore and identify opportunities to increase adoption of B2B e-invoicing by all types and sizes of U.S. businesses. The E-Invoicing Work Group will promote unified e-invoicing standards, processes, and common automated tools that support:

1. Originating and receiving electronic invoice information in standard, uniform syntax(es) and semantic models that are easily integrated into existing software, platforms, and service provider systems.
2. Identifying electronic document exchange methods and processes for transmitting B2B documents to support interoperability between software, platforms, and service providers systems.

Purpose of Document and Cautions

This document is the work product of a group of experts representing corporations, payment operators, standard bodies, payment service providers, and others. Its goal is to facilitate discussion with the broader industry by framing industry challenges and business requirements and to suggest next steps to achieve broader adoption of e-invoicing and straight-through-processing. It should be noted that certain topics in this document have many variants and options, making thorough documentation a difficult task. As a result, this document is intended to capture the majority of electronic invoice technical

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[6] https://fedpaymentsimprovement.org/wp-content/uploads/e-invoicing-white-paper.pdf

[7] The Business Payments Coalition is group of volunteers from national associations, small, medium, and large businesses, financial institutions, technology & software vendors, standards development organizations, and consultants. The mission of the BPC is to collaborate on solving problems related to processing information associated with B2B payments in order to promote use of electronic payments and straight-through-processing

standards in use in the U.S. market. However, the standards listed in this document are not exclusive to the U.S., as many are in use globally, and have various versions or country specific variants. Finally, due to the current market fragmentation, the catalog may not account for every variation that exists and in use by market practitioners. The authors look forward to industry dialogue to refine ideas and gain buy-in for potential paths forward.

Electronic Invoicing – Evolution, Definitions, and Models

Evolution of Electronic Invoices

As mentioned earlier, electronic invoicing traces its roots to the development of EDI. In the early 1960s, Ed Guilbert pioneered the development of electronic message formats when computer systems acquired the capability to exchange data. The first EDI message was transmitted in 1965 when the Holland-American steamship line sent trans-Atlantic shipping manifests[8]. In 1968 the Transportation Data Coordinating Committee (TDCC) was established and began to develop translation rules for existing industry guidelines, and in 1975 the TDCC completed a set of industry standards that any company could adopt for the purposes of exchanging transactional information with their trading partners.[9] In 1978 the American National Standards Institute (ANSI) X12 committee was established and began publishing EDI standards. By 1982 companies in the Automotive Industry and Retailers began mandating sellers to transmit supply chain documents in EDI formats. Then in 1985 the United Nations established UN/EDIFACT to assist with the development and global use of the EDI standard. Currently, more than 144,000 businesses use EDI (X12 or other EDI variants) in the U.S.[10] to communicate with their trading partners or financial institutions.

The emergence of the internet browser in the mid-1990's changed the entire landscape and provided new ways for businesses to exchange electronic data. The introduction of new syntaxes such as Comma Separated Value (CSV), Portable Document Format (PDF), and eXtensible Markup Language (XML) along with new web-based software solutions and processes made it possible for businesses of all sizes to exchange electronic business documents including invoices. Today, there are hundreds of service providers in the market that have leveraged these technologies and offer a variety of solutions to improve automation in the O2C and P2P processing of invoices.

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[8] EDI – A Brief History http://www.doc-process.com/docprocess/?p=1560&lang=en
[9] The History of E-Invoicing – iPayables Blog Post http://www.ipayables.com/history-e-invoicing/
[10] Implementation of GS1 EDI Standards in 2016
https://www.gs1.org/sites/default/files/docs/EDI/EDI%20Implementation%202016%20-%20Detailed%20report.pdf

Participants in the P2P and O2C Processes

In this paper, the following terminology defines the organizational activities and process automation enablers in the P2P and O2C processes.
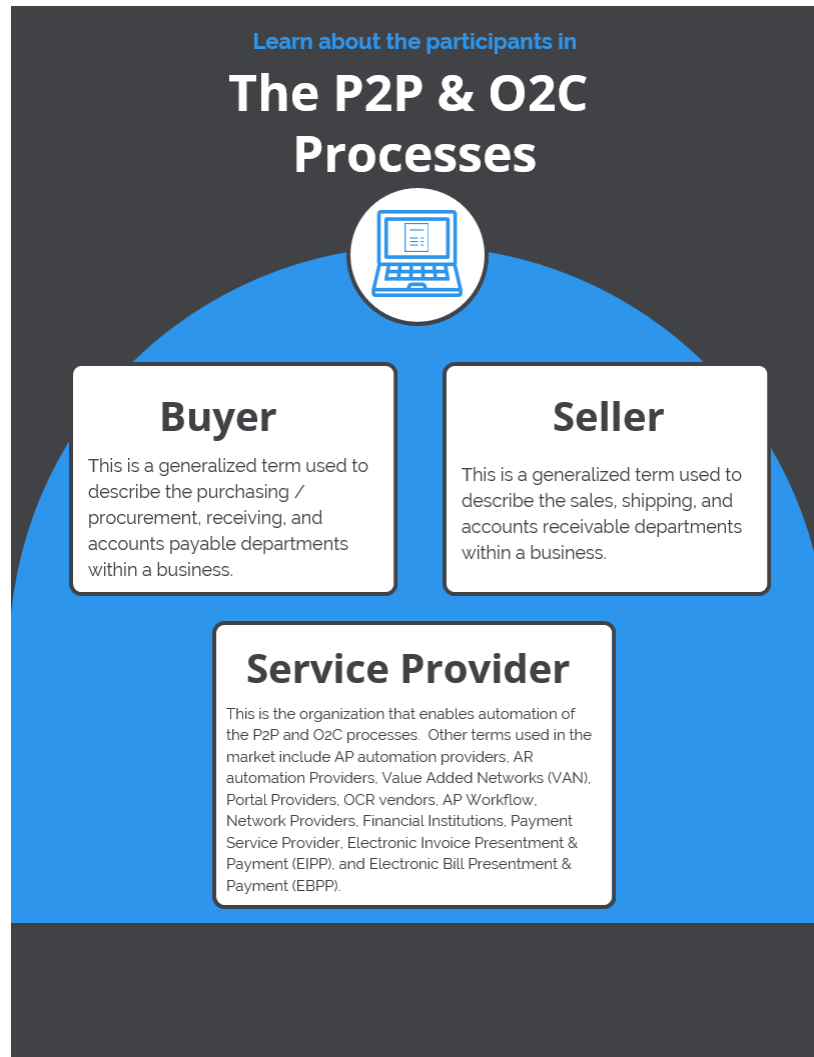
1. Buyer – This is a generalized term used to describe the purchasing / procurement, receiving, and accounts payable departments within a business.
2. Seller – This is a generalized term used to describe the sales, shipping, and accounts receivable departments within a business.
3. Service Provider - This is the organization that enables automation of the P2P and O2C processes. Other terms used in the market include AP automation providers, AR automation Providers, Value Added Networks (VAN), Portal Providers, OCR vendors, AP Workflow, Network Providers, Financial Institutions, Payment Service Provider, Electronic Invoice Presentment & Payment (EIPP), and Electronic Bill Presentment & Payment (EBPP).

Definition of an Electronic Invoice

The definition of an electronic invoice has evolved over time as new technologies were introduced into the market. Currently, a number of definitions can be found including email, PDF, Optical Character Recognition (OCR), and machine-to-machine. Two primary components must exist for an invoice to be considered an "e-invoice". First, the invoice information must be sent in an automated, electronic manner from a seller. Second, the information must be in a format that is capable to be processed by the buyer system in an automated fashion.

Currently, in the U.S. market 25 percent [11] of invoices are sent electronically. However, few can be considered to be true e-invoices. For example, many in the market today claim that an email is an electronic invoice, however, the attached invoice does not contain structured data and the buyer must manually download and / or print the invoice information for processing. Similar limitations exist when the invoice is made available in an unstructured data or PDF format through a portal. When invoices are delivered via fax, or the buyer needs to retrieve the invoice from their email and print it for further processing, this approach cannot be considered a true e-invoice. To provide clarity to the U.S. market, the e-Invoice Work Group has settled on a definition for an electronic invoice to mean *"An invoice that has been issued by the seller, transmitted and received by the buyer in a structured digital format which allows for automated processing."* Defining what a true e-invoice is critical to establish the basis for defining a common syntax and semantics model for U.S. e-invoices.

Definition of an Electronic Invoice:

"An invoice that has been issued by the seller, transmitted and received by the buyer in a structured digital format which allows for automated processing."

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[11] Electronic Invoicing in the U.S.: Challenges and Opportunities https://fedpaymentsimprovement.org/wp-content/uploads/e-invoicing-white-paper.pdf, June 2016

The Financial Supply Chain

The Procure-to-Pay and Order-to-Cash processes (Figure 1) are elements of the financial supply chain. Generally, the processes outlined in Figure 1 represent the high level flows followed by businesses; however, they may differ slightly depending on the type of purchasing (e.g. Direct Materials, Indirect Materials, Services, etc.) and or recurring services being performed. For example, the buyer may call a seller and purchase something over the phone without a purchase order. Or the seller may have a contract to perform a service monthly and bills the buyer accordingly. In each of these instances, no purchase or sales order is generated; however, an invoice is created when the seller delivers goods and services to the buyer.

Consequently, the invoice is a vital bridge between the buyer and seller bring them together in the financial supply chain. The invoice obligates the buyer to pay the seller, it confirms what was purchased, at what price, the terms on when the seller will be paid, and any discounts the buyer may apply. Accuracy of the data is critical to ensure on-time payments.
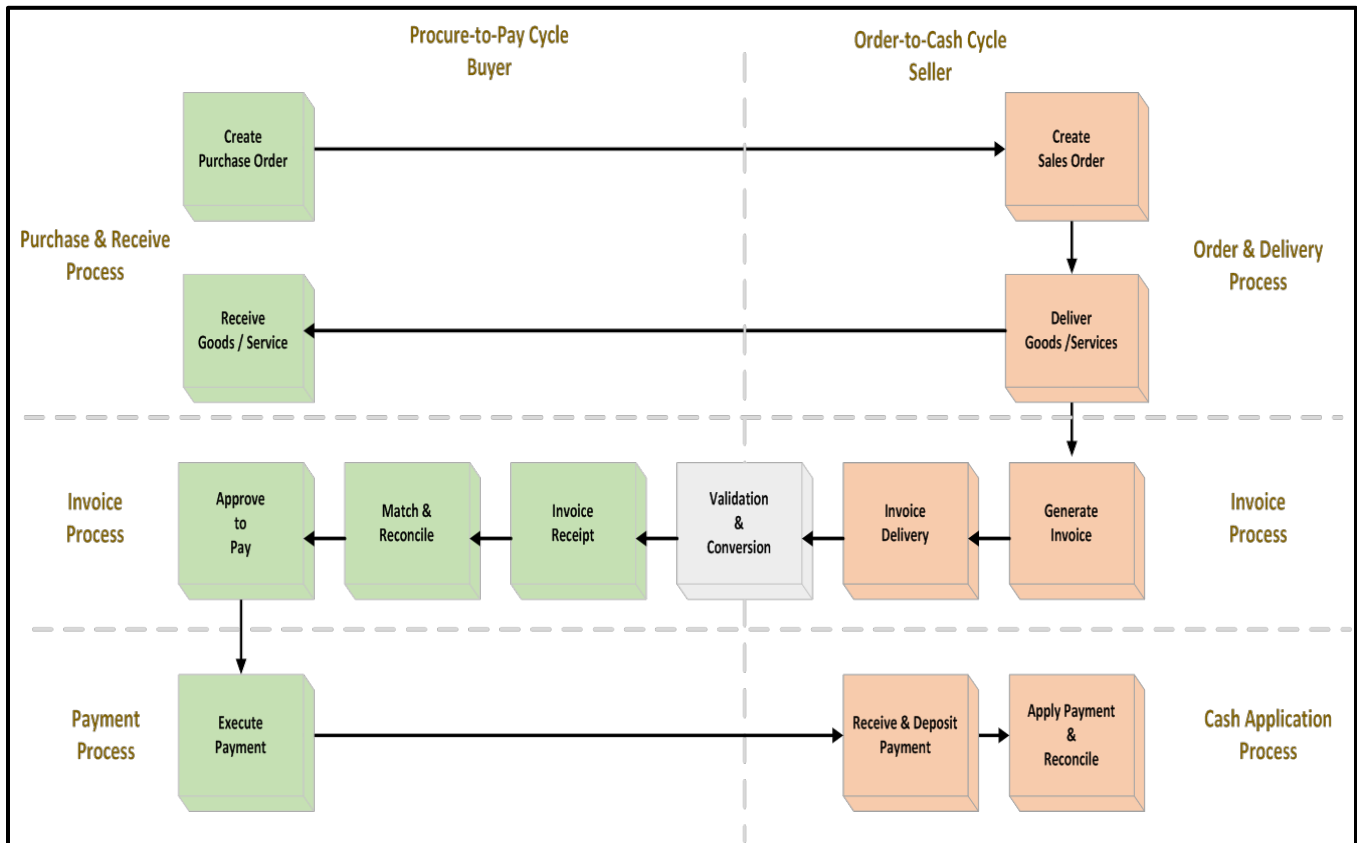

Figure 1: Procure-to-Pay & Order-to-Cash Cycles

The Electronic Invoice Process

Invoice processing (Figure 1) involves five core steps – creation, delivery, validation and conversion, receipt, and processing. To enable these processes electronically, buyers and sellers need to coordinate the integration and transmission of the invoice between many different systems, platforms, and environments. The electronic invoice itself is expressed in various syntaxes, formats, data structures, and technologies, resulting in a multitude of methods for buyers and sellers to send and receive electronic invoices in the P2P and O2C process.

Sending and Receiving Electronic Invoices

Sellers initiate the electronic invoice process. Sellers have many options (Figure 2) to choose from to send invoices.
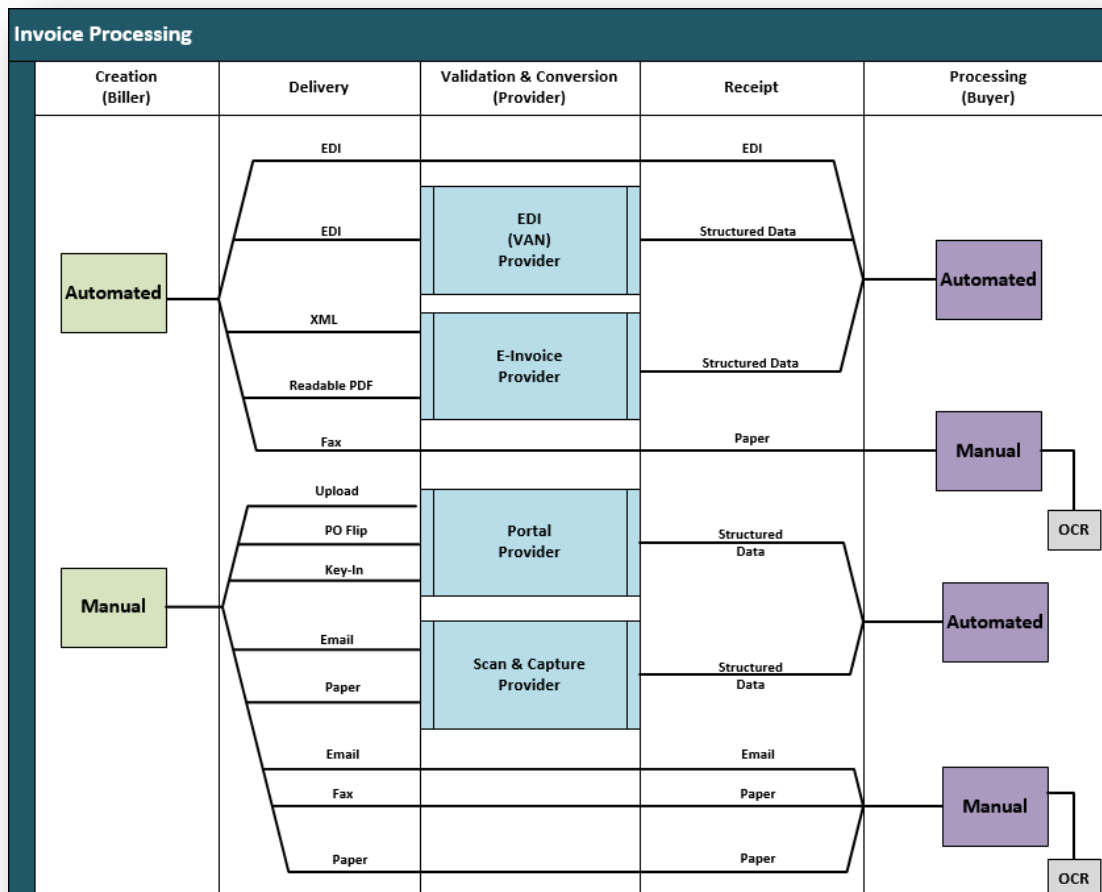

Figure 2: Invoice Processing

Automated Sending

When the seller's system has the capability to create electronic file output (e.g., cXML/EDI/etc.) for the invoice, a file is generated automatically and can be transmitted either directly through a point-to-point connection to the buyer or indirectly through a Service Provider using multiple protocols, including Application Program Interface (API), File Transfer Protocol (FTP), or Virtual Private Network (VPN) Connection. To establish a point-to-point connection, the seller must apply specific technical knowledge to configure, test, and modify their system's output to meet the buyer's data format requirements.

When the seller is sending the file through a Service Provider, the Service Provider translates the file format they receive from the seller into a file format the buyer system can accept.

Additionally, sellers can automate sending the invoice through email or fax using standard functionality of their billing, Customer Relationship Management (CRM), or accounting systems. The customer master data is updated to indicate invoices should be sent by email or fax. For the seller, this capability eliminates the need to perform additional configuration and testing required for file integration. It also streamlines the transmission of the invoice and reduces the processing time and costs with printing and mailing. However, this often results in additional manual processing on the buyer side, eliminating efficiency gains in the overall invoice processing time. The exception to this is if the buyer has implemented an e-invoicing solution that converts and processes PDF-A (structured, readable) files in an automated fashion.

Manual Sending

Printing and mailing the invoice is the most common method in use by U.S. businesses. Sellers batch and print invoices anywhere from daily to monthly. The seller then mails it to the buyer. However, there are several other manual sending processes. Some sellers print, scan, then email or fax the invoice. Another manual option is when the seller is asked by the buyer to send the invoice through a portal.

Portal solutions are used by both buyers and sellers. When the buyer uses a portal for invoice receipt, sellers are required to log-in and process their own invoices. This could include uploading the invoice in a specific format, manually keying the invoice data into a portal webpage, validating invoice data captured through optical character recognition (OCR) software, or converting a purchase order into an invoice (e.g. a PO Flip). In the case of a PO-flip, the buyer sends an electronic copy of the PO from their procurement system to the portal, and the seller then converts the PO to an invoice, adding additional data elements such as invoice number, or ship date.

When the seller uses a portal for invoice delivery, buyers are required to retrieve the invoice from the portal. Buyers receive notification from the seller that an invoice is ready for approval. The buyer logs in and retrieves the invoice to process in their AP software or accounting system. The invoice could be in a CSV file, web enabled EDI file, or pdf format. Once the invoice is approved, the invoice moves to the payment process.

Validation and Conversion

Electronic invoices not delivered through a direct connection between the seller and buyers are processed through a validation and conversion step, where a service provider provides the connection. Several different types of service providers enable sellers and buyers to send and receive the electronic invoice, including Value Added Network (VAN) provider, e-Invoice provider, Portal provider, or Scan & Capture provider (Figure 2).

The conversion from one file format to another is performed by the VAN provider or e-Invoice provider. These types of service providers make up the "e-invoice networks" where sellers and buyers can enroll and exchange invoices without directly connecting (from a point-to-point perspective). Portals and Scan & Capture software facilitate data entry by automatically loading the invoice information into the AP or accounting system for the buyer. Buyers benefit by either shifting the burden of data entry onto the seller (in the case of a portal) or using the OCR software to capture the data from paper (or pdf) and enter it into the AP or accounting system.

Delivery

Electronic invoices are delivered to the buyer in a structured data format, such as EDI or XML, to their AP or accounting system. When invoices are delivered via email, fax, or sent in the mail, the buyer may have a system (for example, in-house OCR capabilities) to help automate the data entry portion of the invoice process.

Invoice Format Matters

Switching from manual to electronic invoices can greatly increase the rate which they are approved and paid

~92%
of invoices received electronically are approved and paid on time

45%
of invoices received manually are approved and paid on time

Processing

In most cases, the invoice process ends once the invoice has been approved and readied for payment to the seller. Exception to this are cases where dispute (such as price, quantity, quality, etc.) arise between the invoice, the order, and what was received by the buyer. For payment to occur, the invoice needs to be entered into the AP or accounting system. Processing time is dependent on how the invoice is received, how it is entered, and how quickly it can be approved. Electronic invoices can be sent near real-time and enable the buyer to process and approve invoices much faster. Electronic invoices can initiate business rules and workflow for routing and approval, reducing the cycle time significantly from receipt to ready to be paid over paper. For example, nearly 92 percent of invoices received electronically are paid on time compared to only 45 percent when invoices are received in paper form and need to be entered into the AP or accounting system by the buyer[12].

In the financial supply chain, electronic invoice processing can be essential for effective working capital strategies for buyers and sellers. Buyers receiving electronic invoices can develop different payment strategies to capture early payment discounts or extend their day's payable outstanding to settle the invoice. Sellers who send electronic invoices can expect to receive early and on-time payments from buyers giving them access to cash early and improving their day's sales outstanding cycle. Sellers sending a paper invoice are reliant on the buyer's ability to process the invoice on time. Paper invoices get lost, mutilated, damaged, sent to the wrong receiver, etc. and cannot be tracked until the buyer enters them into their AP or accounting system. Sellers sending invoices through email or fax achieve partial automation of the process, however, they suffer similar issues, with emails not delivered, not opened, lost, waiting for someone to return from vacation, etc. All of these impact how quickly the seller receives payment from the buyer.

Implementation Models

As previously mentioned, electronic invoicing involves the electronic exchange of the invoice data between trading partners' accounts receivable and accounts payable business processes and systems. Figure 3 is an overview of organizational, technology, and legal layers a business needs to investigate and consider when integrating e-invoices into their business processes.

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[12] Paystream Advisors. 2016 Data Capture and Mailroom Technology Insight Report. The 45% and 92% were calculated by adding the invoice receipt to approval 20-30 day, 10-20 day, 5-10 day, and 1-5 day increments values from the graph for manual data entry and invoice receipt by third-party provider.

Organization Layer	Business Relation	E-Invoicing Models	Software	Business Process

	• Business-to-Business (B2B)
	• Business-to-Consumer (B2C)
	• Business-to-Government (B2G)
		• Direct Model
		  • Seller Direct
		  • Buyer Direct
		• Network / Consolidator Model
			• ERP System
			• Invoice / Billing Software
			• Accounting Software
			• Document Management Systems
			• Workflow Systems
			• Office Software
				• Process Integration
				  • Manual
				  • IS Supported
				  • Fully Automated
				• In-House
				• Outsourcing
				• Service Provider

Technical Layer	Transmission Protocols	Transmission Medium	Data Formats	Message Standards
	• SMTP • FTP / S-FTP • HTTP/HTTPS • X.400 • AS2	• Email • EDI • File Transfer • Service Provider • Portal	• Structured (Oasis UBL, UN/EDIFACT, etc.) • Unstructured (PDF, TXT, etc.)	• Neutral (Oasis UBL, UN/EDIFACT, etc.) • Industry Specific (ISO 20022, GS1XML, etc.) • Proprietary (SAP iDoc) • Country Specific (Finvoice, OIOXML, etc.)

Legal Layer
• Authenticity • Integrity • Legibility • Storage format and period • Corresponding legal requirements (e.g., for accounting)

Figure 3: E-Invoicing Implementation Models [13]

From an organizational perspective, the business needs to consider the type of relationship they have with their trading partner (consumer, business, or government), what e-invoicing model they intend to use or are being asked to use, what type of software they use, and the business process integration that is being considered.

From a technology perspective, the business needs to determine how the invoice will be transmitted (i.e., what protocol and medium), the format the data will be received from or sent in (i.e., formats), and in what message standard the invoice will be sent or received.

Underlying these are the various legal considerations that a business needs to contemplate regarding the storage, retention, authenticity, and integrity of the invoice. This is not intended to be a one-time event, rather, but part of the evolution of the business as it matures across the automation spectrum.

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[13] Cuylen, Kosch, & Breitner. Development of a Maturity Model for Electronic Invoice Processing, Electron Markets (2016):115-127

Electronic Invoice Technical Standards by Syntax

Advancements in how computers present, express, and exchange data have resulted in six different syntaxes. for electronic invoices. From each of these syntaxes, multiple formats and subsets have been created to fit the business needs for the market segments and verticals they serve. Figure 4 depicts the relationship of electronic invoice syntaxes and associated formats and subsets.

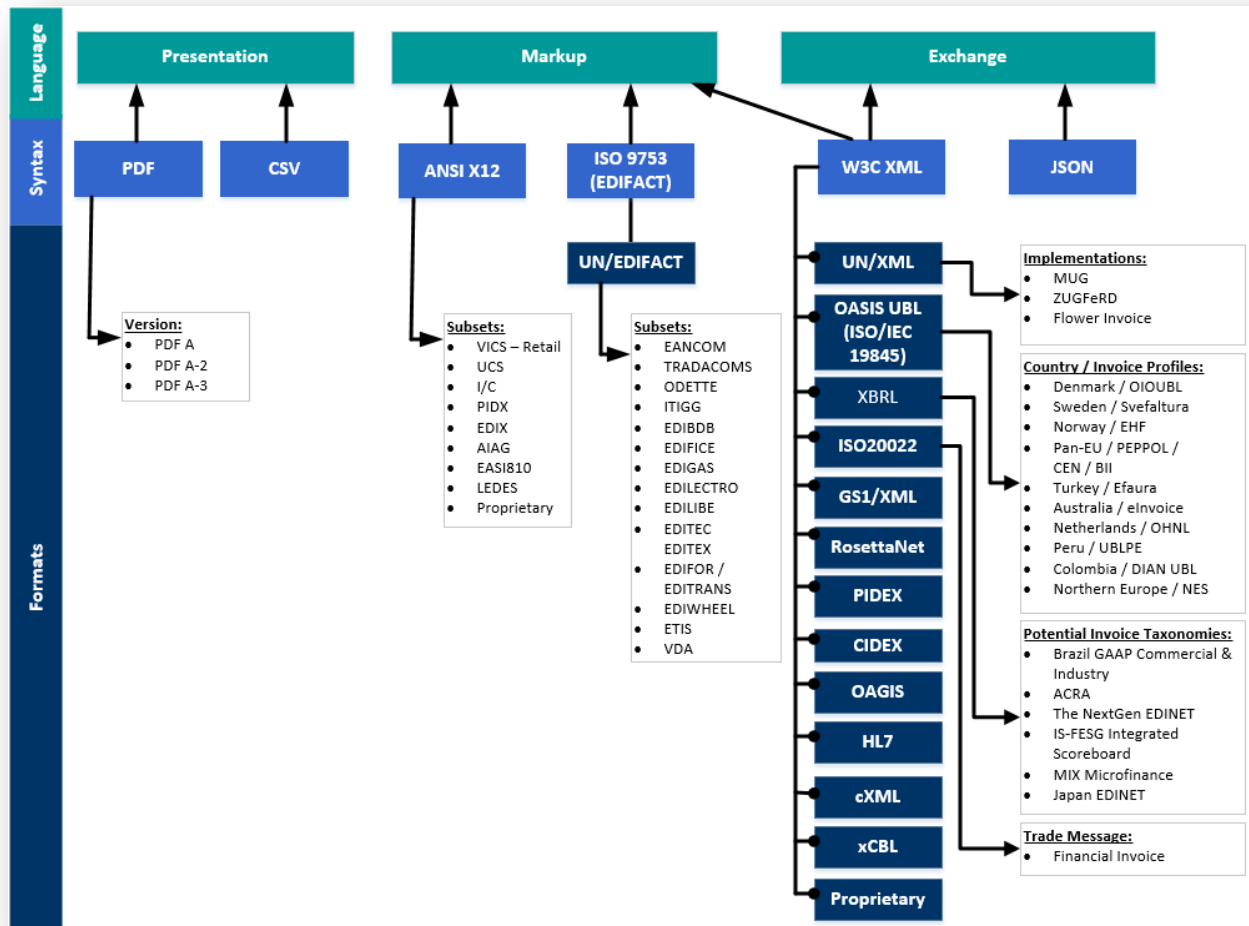Figure 4: Relationship of Different Computer Program Languages and E-Invoice Syntaxes [14]

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[14] Graphic modified from a post by Tim McGrath - https://www.linkedin.com/pulse/you-cant-always-get-what-want-tim-mcgrath October 2016 used with permission

This section of the catalog contains a brief description of each syntax, the associated format and subset, industry in which the format and subset is primarily used, a description of the format and subset, and organization responsible for maintaining the format and subset.

PDF

Ubiquitous amongst industry providers, Portable Document Format (PDF) is a file format used to present and exchange documents reliably, independent of software, hardware, or operating system.

PDF invoices are commonly used as attachments to email in the market. For example, Microsoft Word and Excel have embedded invoice templates that can be created in a PDF format, a low-cost invoicing solution for small businesses. Depending on the format of the PDF, the seller can send the invoice as an email attachment and the buyer can process it through an Optical Character Recognition (OCR) reader or manually open and print for input into Accounts Payable solution or accounting system.

Format	Industry	Description	Organization	Website
PDF / A-1, PDF/A-2, & PDF/A-3		PDF was developed in the early 1990's as a way to share documents. Each format has different capabilities. For example, PDF/A-3 allows for the embedding any document format such as Excel, Word, HTML, CAD or XML files.	ISO$^®$ 32000-1:2008	https://www.iso.org/standard/51502.html

Comma Separated Value (CSV)

Comma Separated Value (CSV) is used for exchanging and converting data between various programs. The format is in common use with various specifications and implementations; however, there are no formal specifications in existence. Due to the lack of a formal specification, interoperability issues between various programs exist and usage of CSV files differ considerably among service providers. CSV files can be constructed with or without a header line, with subsequent lines of data records. Each record can consist of one or more fields, with each field separated by commas. Values may or may not be enclosed with double quotations. E-invoicing portal providers typically support the upload / download of invoice information in the CSV format.

Format	Industry	Description	Organization	Website
CSV		CSV is a file stored in a tabular and plain text and is a very common data exchange format that most spreadsheet applications and database systems can process. Also, many programming languages contain libraries that support CSV files.	N/A	N/A

ANSI X12

The American National Standards Institute (ANSI) X12 develops and maintains EDI supply chain message standards. Over 300+ transaction sets exit, with 9 different invoices messages. For example, X12I Transportation transaction set has 6 invoice messages, including EDI 110 (Air Freight Details and Invoice), EDI 210 (Motor Carrier Freight Details and Invoice), EDI 223 (Consolidators Freight Bill and Invoice), 310 (Ocean Freight Details and Invoice), EDI 410 (Rail Freight details and Invoice), and EDI 859 (Freight Invoice). EDI 810 (Standard Invoice), 811 (Consolidated Service Invoice / Statement), EDI 819 (Joint Interest Billing and Operating Expense Statement), and EDI 880 (Grocery Products Invoice) are messages covered by X12F Finance transaction set. X12 also maintains a corresponding set of XML schemes to the various EDI supply chain messages. EDI allows two organizations to exchange supply chain documents electronically, including invoices (EDI 810 messages).

Format	Industry	Description	Organization	Website
X12		X12 maintains at least 10 different invoice messages, including 110, 210, 223, 310, 410, 859, 810, 811, 819, and 880. Several examples of usage include 210 Motor Freight Details and Invoice message is sent from the carrier to the shipper to request payment of freight charges. The 810 Standard Invoice message is used for invoicing by sellers requesting payment for goods and services.	ANSI X12	http://www.x12.org/
VICS	Retailers	The Voluntary Inter-industry Commerce Standard (VICS) is used by the general merchandise retail industry across North America. It is a subset of the ANSI ASC X 12 national standards. VICS EDI is being	GS1 USA	https://www.gs1us.org/

Format	Industry	Description	Organization	Website
		utilized by thousands of companies, department and specialty retail stores, mass merchandisers and their respective sellers. In 1988 GS1 US became the management and administrative body for VICS EDI.		
UCS	Grocery and Retail	Uniform Communication Standards (UCS) is used by the grocery and retail oriented industries. It is a subset of ANSI X12 standards and is used by a wide variety of businesses including manufactures, retailers, wholesalers, brokers, beverage (alcohol), convenience stores, food service industries, wholesale drug, mass merchandising, service merchandising, and public warehousing.	GS1 USA	https://www.gs1us.org/
I/C		Industrial/Commercial Standard (I/C) is used in the industrial sector. It is a subset of ANSI X12 and is managed by GS1 USA.	GS1 USA	https://www.gs1us.org/
PIDX	Petroleum	Petroleum Industry Data Exchange (PIDX) Used in the Oil & Gas Industry. The standard has broad adoption in every continent with Operators, Sellers, and 3rd party solution providers. The standard addresses specific data needs in the Oil & Gas industry that generic B2B invoice standards do not cover such as well name, location, field name, lease name, etc. PIDX has EDI and XML syntaxes available for members to use.	PIDX International	http://www.pidx.org/
EDIX	Electronics	Electronics Industry Data Exchange (EDIX) develops the requirements for the electronics industry.	ANSI X12	http://www.x12.org/
EAGLE	Hardware / Houseware	An EDI standard developed for and used by the hardware and houseware industry.	ANSI X12	http://www.x12.org/
AIAG	Automotive	Automotive Industry Action Group (AIAG) designs and maintains the transaction set for the auto industry.	AIAG	http://www.aiag.org/
EASI810	Embellished	Embellished Active wear Standards Initiative (EASI) is	EASI Standards	http://www.easistandards.com/

Format	Industry	Description	Organization	Website
	Active wear	an EDI standard developed for and used in the embellished active wear wholesalers, manufactures, distributors, and software providers.		
LEDES	Legal	Legal Electronic Data Exchange Standard (LEDES) is a set of e-billing formats to facilitate electronic data transmission in the legal industry.	LEDES Oversight Committee	https://ledes.org/
Proprietary	Company & Industry Specific Standards	Major manufacturers such as General Motors or industry specific interest groups such as the Rail Committee of Information Standards have established their own set of EDI standards to be used with their trading partners. These standards are all based on ANSI X12.	N/A	N/A

ISO 9753 / EDIFACT

United Nations/Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT) is the international standard developed by the United Nations. The work of maintenance and further development of this standard is done through the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) under the UN Economic Commission for Europe. The EDIFACT standard provides a set of syntax rules to structure, an interactive exchange protocol and a set of standard messages which allow multi-country and multi-industry exchange of electronic business documents. EDIFACT is used by global Fortune 500 companies in the U.S. and widely across Europe, mainly due to the fact that many companies adopted it very early on.

Format	Industry	Description	Organization	Website
GS1 EANCOM	Retail / Healthcare / Construction / Publishing	GS1 EANCOM brings together the GS1 standards that identify trade items with logistics units and global location numbers (GLNs).	GS1	https://www.gs1.org/eancom

Format	Industry	Description	Organization	Website
TRADECOMS	Retail	EDI standard primarily used by the UK retail sector. Introduced in 1982, it was a precursor to EDIFACT.	UK Article Number Association (GS1 UK)	https://www.gs1uk.org
ODETTE	Automotive	The Organization for Data Exchange by Tele Transmission represents the interests of the automotive industry in Europe. They are the equivalent of the Automotive Industry Action Group (AIAG) in North America.	Odette International	https://www.odette.org/
ITIGG	Transportation	International Transportation Implementation Guideline Group (ITIGG) is an international group of experts engaged in the development and implementation of UN/EDIFACT standard messages for electronic trading in the transport industry.	UN / EDIFACT	http://uic.org/_static/it/best/ITIGG/main.htm
EDIFICE	High Tech	EDIFICE, is a non-profit organization that promotes adoption and influence standards development for global networks for B2B Integration in High Tech industries.	EDIFACE	https://wp1.edifice.org/
EDIGAS	Gas Industry	EDIGAS is an EDI standard for the purchase, sales, transportation and storage of gas developed by the message and workflow design working group.	EDIG@S	https://www.edigas.org/
VDA	Automotive	Verband der Automobilindustrie, the German Automotive Industry Association which manages a set of EDI messages to exchange between German automotive manufacturers and sellers.	VDA	https://www.vda.de/en.html
EDItX	Book Industry	EDItEUR is the standard used in the book industry. 2 different transaction document formats exist, with EDItX Trade Invoice Transaction format is used by publishers, distributers, wholesalers, and retailers. The EDItX Library Invoice format is used by library suppliers to libraries.	Book Industry Study Group (BISG) – Commerce Standards & Optimization	http://www.editeur.org/88/EDItX-Overview/

Format	Industry	Description	Organization	Website
		working group		
EDIFOR/EDITRANS	Transportation	EDI for the Transportation System. EDI 210 is sent from the carrier to the shipper to request payment of freight charges.	N/A	N/A
EDIWHEEL	Wheels & Tires	Used in the tire trade industry in Europe based EDIFACT.	N/A	http://www.ediwheel.net/en/standard.htm

W3C XML

The World Wide Web Consortium (W3C) is the standards organization for the World Wide Web. The W3C develops and manages Extensible Markup Language (XML). XML is a defined set of rules for encoding documents in both human-readable and machine-readable formats.

Format	Industry	Description	Organization	Website
UN/EDIFACT-XML		UN/EDIFACT – XML is the XML version of the global Electronic Data Interchange (EDI) standards. The standard is used internationally, across both the public and private sectors, and in verticals such as retail, transport and logistics, customs, healthcare, agriculture and insurance. The UN/EDIFACT standard was used by more than 100,000 entities in 2014.	United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT)	https://www.unece.org/cefact/edifact/welcome.html
Universal Business Language (UBL)		UBL is a series of open standards for XML based business documents for procurement and transportation. UBL is design to integrate into paper-based business processes and is designed to eliminate fax and re-keying of data in business correspondence. UBL v2.1 was approved as an ISO / IEC 19845:2015 standard, and current version contains 65 document schemas. UBL can trace its origins back to EDI standards and other derived XML standards.	Organization for the Advancement of Structured Information Standards (OASIS)	https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl

Format	Industry	Description	Organization	Website
XBRL		XBRL (eXtensible Business Reporting Language) is a standard used to exchange business information and is used primarily by corporations for reporting business information such as financial results, Security Exchange Commission (SEC) filings. XBRL is also used in the automation of matching purchase orders, receiving documents and invoices.	XBRL International	https://www.xbrl.org/
ISO 20022 – Trade Invoice Messages		The ISO 20022 Trade Services Messages include a set of messages Invoicing messages (tsin – trade Services Initiation, tsmt – Trade Services Management, & auth – Authorities) for the facilitation of invoice financing, factoring, discounting, and invoice tax reporting.	ISO 20022	https://www.iso20022.org/trade_services_standards_evaluation_group.page
cXML		cXML (commerce eXtensible Markup Language) Created by Ariba in 1999, is a protocol for communication of business documents between procurement applications, e-commerce hubs and sellers. cXML is based on XML and provides formal XML schemas for standard business transactions, allowing programs to modify and validate documents without prior knowledge of their form.	Ariba	http://cxml.org/
xCBL		xCBL (eXtensible Common Business Library) is a collection of XML specifications (both the DTD and XML Scheme) for use in e-business, primarily in B2B procurement tools for buyers, order and invoice management tools for sellers and document routing tools for public and private marketplaces.	Perfect Commerce	http://www.xcbl.org/
GS1/XML		Designed for information exchanged over the internet. GS1 uses XML to create a set of standard messages for the GS1 EDI. The GS1 XML messages can be exchanged using any technical solution or internet transport protocol.	GS1 / USA	https://www.gs1.org/edi-xml/technical-user-guide/11_Message_architecture

Format	Industry	Description	Organization	Website
RosettaNet	High Tech and Electronics	RosettaNet standards are used by the high-tech and electronics community and have been developed to implement industry-wide, open e-business process standards to form a common e-business language with the goal to align processes between supply chain partners on a global basis.	GS1 / USA	https://resources.gs1us.org/rosettanet
HL7	Healthcare	HL7v3 messaging standards are used to acquire information used in the billing systems by the payer for the purpose of aggregating financial transactions to be submitted for claims or invoices for reimbursement.	Health Level Seven International	http://www.hl7.org/
CIDX	Chemical	Chemical Industry Data eXchange CIDX was a trade association and standards body focused on realizing transactional efficiency throughout the global chemical industry supply chain. At the end of 2008, CIDX transitioned its standards and operations to the Open Application Group, (OAGi) and the American Chemistry Council's Chemical Information Technology Center (ChemITC).	Open Application Group (AOGi)	http://www.oagi.org/dnn2/
PIDX	Petroleum	Used in the Oil & Gas Industry. The standard has broad adoption in every continent with Operators, Sellers, and 3rd party solution providers. The standard addresses specific data needs in the Oil & Gas industry that generic B2B invoice standards do not cover such as well name, location, field name, lease name, etc. PIDX has EDI and XML syntaxes available for members to use.	PIDX International	http://www.pidx.org
OAGIS		Open Applications Group, inc. (OAGi) develops cross industry standards and established the Open Applications Group Integration Specifications (OAGIS).	Open Application Group (AOGi)	http://www.oagi.org/dnn2/

Format	Industry	Description	Organization	Website
Proprietary	Company & Industry Specific Standards	Proprietary standards developed by Software, Enterprise Resource Platforms (ERP) for the purpose of exchanging data, documents, etc. For example, SAP® uses iDocs (Intermediate Document) as format for business transaction data transfers. iDocs can be used by Non-SAP systems as a standard interface for data transfers. This has become a de facto standard due to its market share. The document is similar to XML, but differs in syntax.	N/A	N/A

JavaScript Object Notation (JSON)

JavaScript Object Notation (JSON) is syntax for storing and exchanging data. Similar to XML, JSON is a self-describing, human readable syntax, structured in hierarchical fashion, and is easily parsed in many different programming languages. The main difference between XML and JSON is JSON can by parsed by a standard JavaScript function, whereas XML has to be parsed with a XML parser. In the case of a structured document such as an invoice, JSON can be faster and easier for the programs to process the data.

Format	Industry	Description	Organization	Website
UBL2.x		Universal Business Language (UBL) Technical Committee has developed a JSON version of the UBL specification.	OASIS	https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl
Proprietary	Company & Industry Specific Standards	Used by service providers typically through an API to retrieve and post invoice data. APIs may be published by the service provider in order for others to pass invoice data.	N/A	N/A

Conclusion

As stated earlier, the purpose of this document is to catalog the electronic invoice technical standards used by U.S. businesses. Businesses have many different options and considerations they must choose from in order to send and receive electronic invoices. Compounding the challenge are the many different invoice technical standards that exist in the U.S. market. This results in in interoperability issues to integrate with their trading partners to transmit and receive electronic invoices. To address these issues will require a broad, coordinated effort among the many market participants. This document helps lay the foundation to select an invoice standard for the U.S. market to accelerate the adoption of electronic invoicing. The catalyst to do this will be the continuation of the Business Payments Coalition E-Invoicing Work Group.

Next Steps

The Business Coalition E-Invoicing Work Group will re-convene in November 2017 and begin the work to define an invoice technical standard and interoperability framework for the U.S. market in order to accelerate the adoption of electronic invoices for all sizes of businesses while not disrupting current implementations.

For further information about this project, please contact:
Todd M. Albers
Sr. Payments Consultant
Federal Reserve Bank of Minneapolis
90 Hennepin Avenue, P.O. Box 291
Minneapolis, MN 55480-0291
Email – mpls.psog.events@mpls.frb.org

E-Invoicing Work Group

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Name	Organization
Michael Jasper	Basware
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Chris Pfeiffer	Federal Reserve Bank of St. Louis
Patti Ritter	Federal Reserve Bank of Minneapolis

Appendix

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Glossary of Terms

Buyer Direct Model – Buyer require sellers to send invoices directly to an e-invoicing / invoice management system.

EDI (VAN) Providers - Provide a network where EDI documents can be exchanged between business partners typically through a mailbox service. The EDI provider connects the seller and buyer together to enable the exchange of documents through the network.

Interoperability – Refers to the ability for computer programs to exchange data via a common set of formats, to read and write the same file format, and to use the same protocols.

E-Invoice Providers – Provide a network where electronic invoices can be exchanged between business partners, regardless of formats. The E-Invoice provider will map the incoming invoice file from the seller and map the outgoing invoice file to the buyer. This process allows for the exchange of the invoice across multiple sellers and buyers without the need to integrate directly with one another.

E-Invoice Portal Provider – Portal solution that a buyer or seller implements to enable sending or retrieving invoices. Portals can also be built in house by the buyer or seller, which directly integrates into their back office processes.

Format – Refers to the layout of the data. When a file is received by a computer program, the program accepts the data as a input in a specific way, reads and processes the file, and provides an output that is similar or an another format.

Network Model – Buyers and sellers interact through a network provider. Network provider functionality frequently adds accounts payable and accounts receivable automation, including work flow, approval, payment and ERP integration.

Scan & Capture Provider – Provider who recognizes key data fields on an invoice and reads the information into a structured data file. Invoices can be received in multiple formats such as PDFs, Scanned Images, and Emails).The file can then be fed into the accounts payable system for processing.

Seller Direct Model – Sellers distribute invoices via email, portal, or e-invoice to a buyer.

Semantics – Refers to the *meaning* of an instruction. For example, if you misspell the word "Enter", it is a syntax error. If the command is legal, however, it does not make any sense in the current context, it's a semantics error.

Syntax – Refers to the *spelling* and *grammar* of programing languages. Each program language defines its own syntactical rules that control which words the computer understands, which combination of words are meaningful, and which punctuation is necessary to be correctly structured document.