

EBUSINESS FUNDAMENTALS FOR THE AGRICULTURE PROFESSIONAL

*WHY EBUSINESS IS ESSENTIAL TO TODAY'S AGRICULTURAL
BUSINESSES*

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WHY EBUSINESS IS ESSENTIAL TO TODAY'S AGRICULTURAL BUSINESSES

SUMMARY

This paper gives a general overview of why eBusiness is critical to the ongoing success of agricultural businesses, and gives some basic guidance on how to incorporate eBusiness into corporate strategy. It then lays out eBusiness fundamentals, key organizations involved in ag eBusiness, and implementation fundamentals.

THE ESSENTIAL ROLE OF EBUSINESS IN AG BUSINESS STRATEGY

The use of eBusiness and eBusiness standards is a strategic and critical success factor for agricultural companies today. In general, using electronic business processes increases business efficiencies, better leverages human resources, decreases errors and improves customer satisfaction (internal and external). Importantly, the use of eBusiness removes some of the risk involved with doing business, because it makes certain key operations less prone to error and uncertainty.

THE REALITY OF CHANGE

It's important to recognize that decisions about how fully to adapt eBusiness practices, and how quickly, are not contemplated in a static environment. Agriculture is changing – and rapidly. Traditional operational practices (forecasts, purchase orders, ship notices, invoices, etc.) that don't leverage eBusiness may be manageable for your business today, but could quickly become cumbersome in the next year, or even the next few months.

Any progressive ag business is well aware of the forces of change in the ag industry, which include the increasing globalization of trade and agriculture businesses, demands on producing more with fewer resources, and increased government regulation of the food and ag sectors – including increased focus on traceability and sustainability. These forces contribute to increasing operational complexity, the need to manage more and more data, and heightened international and domestic market pressures. At the same time, more growers and farmers are increasing their use of new technologies, which requires more exchange of data all along the supply chain. And the technologies themselves do not remain static, but continue to evolve.

All of these forces are competitive concerns, and companies that better leverage eBusiness will, generally speaking, put themselves on stronger competitive footing. Being able to exchange information electronically with your trading partners “greases the skids” throughout the ag

supply chain. Those who cannot join in the process will at some point be considered outside the standard business practices of modern agriculture. In addition, standards-based eBusiness makes a business more agile; it enables a company to more quickly ramp up activities critical to its own strategic plan. Primary contributors to business growth – integrating an acquisition, completing a divestiture, entering into joint ventures, and entering into new markets and geographies, are all easier when working with established standards for electronic communication. eBusiness is an enabler, a key to expanding a company’s strategic options.

In Nicholas Carr’s 2003 Harvard Business Review article, “IT Doesn’t Matter”, Carr briefly explains the history of electricity implementation in business from discovery, tactical implementation, strategic implementation, to today. Today, electricity implementations don’t factor in company strategies. It’s a utility. It’s a given. Views on eBusiness are slowly but surely trending in that direction.

Current Ag Company Approaches to eBusiness

Adoption of eBusiness practices is increasing in the agriculture industry each year. One measure of this growth is that membership in AgGateway – the non-profit trade organization committed to promoting, enabling and expanding the use of eBusiness in agriculture – more than doubled between 2010 and 2014 and is at more than 230 companies and growing (as of June 2015). Membership includes key leadership from various ag sectors – from seed and crop protection, to precision agriculture.

When you look at agriculture as a whole, adoption of eBusiness practices continues to evolve. Some companies only address eBusiness issues and opportunities as they arise. These companies often identify business opportunities and then set about to get the IT support they need. They also may be pressured to add eBusiness support to a new or changing process with an important trading partner.

Other companies have an eBusiness strategy that is integral to their company’s strategy. These companies generally have strong executive leaders who had a hand in developing the eBusiness component of their company’s business strategy. While this approach is clearly the goal, it’s important for such companies to also watch for pitfalls. One pitfall is that once a “good” strategy has been developed, it can become stagnant year-to-year in an “if it ain’t broke, don’t fix it” environment. This can be dangerous given that the foundation of eBusiness is a rapidly changing technology landscape.

A worthy goal is for companies to consider the eBusiness aspect of all applicable business strategic, tactical and operational decisions as they are formulated and executed.

How to Integrate eBusiness into Your Business Plan

eBusiness strategy must be integrated into a company's overall business strategy to be effective. To do so, for each element of business strategy, consider the following:

- What activities do we conduct with trading partners that could be done electronically? (These are the “processes” described in the eBusiness fundamentals section below.)
- What information is exchanged to support each process? (“messages”)
- What things must be identified in messages and how are they identified? (“identifiers”)
- How will messages be exchanged between your company and your trading partners? (“transport and routing”)
- What data might your trading partners consider their own, requiring consideration of an agreement between your company and theirs? (“data privacy, security and ownership”)

The conversation above might be a meeting or series of meetings between key members of the executive staff (e.g., chief executive officer, chief operating officer, chief marketing officer) and the leadership in finance and IT. This team can then prioritize these processes based on the company's overall business strategy. (That is, asking “Which are the most important processes for us to streamline and improve?”) Prioritization might depend on a specific customer relationship, a competitive field your business is in, or steps you want to take to maximize resources and efficiencies within your company and increase your competitive position.

For those priority processes, companies can then develop a plan for implementation. A key question will be whether there are existing standards and/or guidelines that apply to the process (see below), or if such standards still need to be developed to enable electronic communication.

Key Resources: As you develop implementation plans, take full advantage of the resources that AgGateway and others make available to you. These include but are by no means limited to:

- **AgGateway:** As a non-profit, collaborative organization, AgGateway is focused on helping ag companies implement eBusiness practices. Feel free to run your “priority list” of eBusiness projects by the staff to determine the status of standards and guidelines for that process, and to help formulate next steps. Take advantage of the open working group meetings – including those held at the Mid-Year Meeting and Annual Conference – to determine how to move projects forward that are key to your eBusiness priorities.
- **AGIIS:** As noted later in this paper, AgGateway provides an identifier directory service called the Agriculture Industry Identification System (AGIIS). AGIIS provides identifiers and associated attributes for businesses, consumers and locations; identifiers and associated attributes for seed license agreements; and identifiers and associated attributes for some products/logistics units.

- **AgGateway Enabling Services:** For companies that need more extensive assistance in getting eBusiness projects started, AgGateway offers expert assistance on a fee basis. Again, you can meet with staff to review and evaluate your needs for the best outcome.

EBUSINESS FUNDAMENTALS

This section of the paper reviews eBusiness fundamentals – the “nuts and bolts” of what is required in electronic exchange of information.

Processes

The importance of processes cannot be overstated. The most basic perspective of a process is that it's *doing stuff* and a company must *do stuff* to make money. Furthermore, process is critical to effectively implementing eBusiness systems. So often implementers want to jump right to the message (e.g., purchase order, invoice) without fully understanding individually, within a company, and among a set of trading partners what the process is in which a message sent. Messages are not exchanged in a vacuum. Messages are always exchanged in the context of a process. They're sent in support of *doing stuff*.

There are two ways of thinking about processes: activity flows, and states and transitions. Activity flows are simply an ordered set of activities (or actions). The process starts. “A” happens. Then “B” happens. Then “C” happens. Then the process is complete. Flow charts are likely a familiar way of expressing activity flows. A key characteristic of flow charts is conditional flow. If condition “X”, then “D” happens; otherwise “E” happens.

A states and transitions view of a process considers the process as always being in a particular state. Events occurs that change the process state. While thinking of entire processes in terms of states and transitions is not common, it's quite common to think of specific points of a process in those terms. *What's the status of ...?* Processes as states and transitions can be expressed in diagrams and prose. We'll examine these approaches in the next section: *eBusiness Standards, Guidelines, and Implementation Technologies*.

Messages

Messages, or documents, are frequently the most identifiable aspect of eBusiness. It's natural to converse in terms of purchase orders, inventory reports, and invoices.

Message Name: The name of a message is important in that it is the term used in conversation among people within a company and between companies and their trading partners. When processes are documented, message names anchor the message in the context of the processes in which they occur. Often message names are bipartite (e.g., *OrderCreate*) with one part referring

to an object (e.g., *Order*) and another part referring to an action (e.g., *Create*). More on this in section on standards.

Message structure refers to how message data is organized and possibly tagged. Often messages have a header with information that generally occurs just once, and a body with repeating information. Some message syntaxes (notably XML) include tags that identify the data that follows. Some messages include envelope information. eBusiness standards experts are divided in their opinions on what envelope-related data should be specified at a message level versus at a transport and routing level. We'll touch on enveloping in the *Message Transport & Routing* section, and address it in more detail in the *eBusiness Standards, Guidelines, and Implementation Technologies* section.

Message data is the meat of any business message. Structure can tell you that something is a shipping address, but data tells you what the address is. It is important to understand that ultimately systems and/or people interpret data as values that stand alone, or as values that refer to a concept further defined elsewhere. Let's explore common types of data.

- **Stand-alone values:** These are values that cannot be further de-referenced. They include such values as *Tom* as a first name, *Enid* as a city, and *7* as a quantity. Often a related set of stand-alone values can be referred to by an identifier, which brings us to our next type of data.
- **Identifiers:** Simply put, identifier value types refer to something that generally would need to be described in a set of values. For example, *23232399* could be the identifier for ACME Widget Company's bill-to location, *83838311* could be the identifier for one of ACME's Bluetooth-enabled turbo widgets. Identifiers are a critical concept in messaging, and are explored in more detail in the next section.
- **Code list values:** Code list values are a sub-type of identifier. They are often defined by industry associations, national standards organizations, or global standards organizations. More on code lists in a later section. Code list values usually change less frequently than identifier lists. Code lists can be a meaningless code (e.g., *123*), short meaningful code (e.g., *EUR* for *Euro*), or a word or phrase (e.g., *exceed*).
- **Reference data:** Reference data is a term commonly used among companies who provide agricultural field operations solutions (and perhaps others). While *reference data* is presently not clearly defined as a category distinct from other data types, it is generally understood to be possibly frequently-changing lists of acceptable values provided by some authority. In that sense, identifiers and code lists would be regarded as reference data. However, reference data can also be a long list of descriptive words or phrases.

Identifiers

Identifiers identify stuff. That's obvious. But let's break that down a bit. A reason that something is identified with an identifier is because it would be tedious to communicate all the data required to otherwise identify the referent. That means that identifiers must be unique within a given scope, that the scope is clearly understood by all systems that process the data, and that the authority for identifier creation and assignment is clear.

While people intuitively understand that an identifier refers to a single thing, many people don't appreciate that a thing must have a single identifier, or alternatively have a way to indicate that two or more identifiers refer to the same thing. (A common pattern for addressing this is by declaring a *master identifier* to which other identifiers are related.)

As a general rule, the characters in an identifier should not have semantics beyond the identity of the referent. For example, using a person's mobile phone number as their identifier, while seemingly convenient, can lead to negative consequences. Phone numbers change. The consequences are that a process must be put in place to change the person's identifier (leaving a disconnect to historical data) or leaving the identifier unchanged resulting in broken processes that depend upon an employee being able to call a person using their identifier.

A consequence of a clear identifier scheme, and authoritative identifier creation and assignment process is that two things can unequivocally be determined to be the same or, equally important, different from one another. This concept is critical within an enterprise and within a trading-partner community.

Message Transport & Routing

Message transport and routing addresses the part of the eBusiness process whereby messages are delivered from one system to another. For simple eBusiness implementations, this could be a directory accessible to both the sender and the receiver through FTP. More robust systems require standards-based solutions, which are discussed in the *eBusiness Standards, Guidelines, and Implementation Technologies* section.

Envelopes: Message envelopes are sometime regarded as part of a message itself and sometimes regarded as part of the message transport and routing layer. Message envelopes may provide such information as:

- Who the sending party is
- Who the intended receiving party is
- What sort of normal processing is expected
- What sort of error processing is expected
- Encoding information

The term *envelope* stems from use describing message contents as being *wrapped by* or *inserted in* an envelope. One might also hear the term *message metadata* or *message header* although with the latter one must be careful to distinguish between transport and routing header data and message contents header (i.e., the *header* in the common *header/detail* message structure pattern).

Data Security, Ownership, and Privacy

Basic principles of **security** include:

- **Privacy:** Message contents are readable only by the sender and intended recipient.
- **Authentication:** The sender's identity can be verified by the receiver (and vice-versa, if necessary).
- **Integrity:** The receiver can verify that what they received is what the sender sent (i.e., the message was not altered in route).
- **Non-Repudiation:** The receiver has a means whereby they can confirm that a particular sender sent a specific message such that the sender can't credibly deny it. Optionally there may be the ability to affirm date/time.
- **Authorization:** The sender is permitted to deliver a particular message to a receiver and to expect such message to be processed by the receiver.

Circumstances dictate which combination of the five security components are required, and how they are to be implemented.

Data ownership and privacy: The term *data privacy* is often used in the context of one party providing data to another party for a narrowly specified purpose. For example, one party may deliver data to another party for the purposes of transforming the data into an industry format and passing it on to a *final* recipient. Another example would be a pool of data owners providing data to a service provider for the purposes of receiving benchmarking reports.

In many cases, many kinds of data are *owned* by the sender; what intermediaries and final recipients may do with that data must be explicitly permitted by the data owner through written agreement. It is beyond the scope of this paper to break down types of data (in a privacy/ownership context) and the nature of agreements between data owners and other parties. These are first and foremost legal and business-relationship matters. Technology plays a role in enabling secure data flows.

Message Creation and Consumption

The steps in the **message creation** process are straightforward:

1. An event occurs in your business that triggers a need to send a message. For example, the event could be the need to order triggered by low inventory.

2. Create/retrieve data from appropriate system or systems.
3. Format the data in a way agreeable to your trading partner.
4. Deliver message to business messaging server, with metadata as required. (At this point the messaging server delivers the message to the trading partner's system.)
5. Process business acknowledgements as required (this step overlaps with message consumption).

While processes among trading partners are usually documented at a bird's-eye view of the interactions between firewalls, such documentation should provide useful references to which internal message-creation triggers can point. For example, low-inventory order triggers are critical to clearly understand within your own business, including understanding how such an internal process integrates with the order-to-cash process as shared between you and your trading partner. While discussing the internal triggers and activities with a trading partner may help round out a conversation, such things are usually irrelevant to the day-to-day eBusiness operations.

The process and ease of creating/retrieving data varies widely across companies and across business processes within companies. In some circumstances the data may be entirely contained within the system producing the message and conveniently available. In other circumstances the data may be strewn across several systems and geographies. For some companies it's not a big deal. For other companies it's a major ordeal.

Formatting data in a format agreeable to your trading partner of course implies that such an agreement is in place. More on this topic in the *eBusiness Standards, Guidelines, and Implementation Technologies* section. Once data has been created/retrieved, formatting the data in the agreed-upon format depends on a number of factors:

- Does the business system support the format “out of the box”?
- Does the format of the source data and the agreed-upon format lend itself to straightforward mapping?
- Does the company have expertise on staff or available who:
 - understands the agreed-upon format?
 - understands the required message syntax (e.g., XML, EDI, JSON)?
 - understands the business rules that shape the message requirements in various contexts?

Usually delivering messages to business messaging servers is straightforward. However challenges can arise due to real or perceived process incompatibilities among trading partners and/or industry segments. For example, trading partner X might demand that the technical details

of a process must be implemented in a way that's incompatible with what trading partner Y requires.

Finally, systems must respond appropriately to business acknowledgments. For example, an order was accepted, an order was rejected and for what reason. Given that such acknowledgements are messages themselves, it might seem out of place to mention them here rather than in the *Message Consumption* section, but it's important to understand that creating and "putting a message on the wire" is not the end of the story for the message.

Message consumption is the process of receiving a file and processing it. Steps include:

1. Store the messages in a persistent data store (e.g., database, file system, cloud service)
2. Determine the business-process context to which the incoming message applies. Does the message initiate a new instance of a process or is it a step in a process instance already in progress?
3. Perform security validation, if necessary (e.g., authentication, authorization, integrity, non-repudiation—the first two of which may be implemented as transport-and-routing-layer functions)
4. Confirm that message is complete, consistent, and conforms to business rules.
5. If necessary, transform the message into a format (or formats) suitable for ingestion into the receiving system.
6. Ingest the message content.
7. Confirm conformance to additional business rules not validated earlier.
8. Provide business-level acknowledgements to the sender per agreement.

As with message creation, the level of effort to ingest message content varies widely across companies and across business processes within companies.

EBUSINESS STANDARDS, GUIDELINES, AND IMPLEMENTATION TECHNOLOGIES

Organizations

AgGateway

AgGateway was established in 2005 with the mission to promote, enable and expand eBusiness in agriculture. With its focus on enablement, AgGateway facilitates standards-based agriculture-industry eBusiness implementation projects. During projects, AgGateway facilitates the process of:

- developing business use cases
- identifying supporting messages

- documenting context-specific message implementation guidelines
- connecting with its industry identifier directory
- agreeing on transport and routing protocols

AgGateway's membership is open to any company doing business in agriculture. AgGateway prefers to partner with organizations to facilitate implementing standards and guidelines already available, but it is quite proficient at developing its own.

OAG

The Open Application Group (OAG) is AgGateway's partner for developing, maintaining, and publishing message standards. OAG has developed global, cross-industry standards since the 1990s and released OAGIS 10 in 2013, which introduced support for agriculture and chemical industry requirements.

AgXML

From 2001 to 2011, AgXML developed standards and guidelines applicable to grain and oilseed production processes. In 2012 its member companies agreed to conduct further standards-related activities within AgGateway's Grain Council.

AEF

The Agricultural Industry Electronics Foundation (AEF) is a user platform that provides resources and know-how for the increased use of electronic and electrical systems in farming. It is an important source of reference data used in messages applicable to field operations.

ISO

The International Organization for Standardization (ISO) is well known and produces a number of standards applicable to agriculture. ISO 11783/10 is one standard with particular eBusiness applicability to agriculture in that it provides the basis for messages that support to field operations.

ASABE

The American Society of Agricultural and Biological Engineers (ASABE) develops standards that are foundational to agriculture. While they don't develop eBusiness standards per se, their work gives rise to improvements in agriculture that require eBusiness support to fully realize the benefits. ASABE is also an excellent source of glossary terms and definitions.

GS1

GS1 manages identifiers for legal entities, locations, products, and logistics units, which AgGateway uses.

Others

Several other standards groups are relevant to the agriculture industry, but not in agriculture-specific ways. Notably, the Internet Engineering Task Force (IETF), The World Wide Web Consortium (W3C), the United Nations Center for Trade Facilitation and Electronic Business, the Object Management Group, and the Organization for the Advancement of Structured Information Systems (OASIS).

Business Process Guidelines

In the agriculture industry, AgGateway has developed business process guidelines to describe the process that is being electronically enabled (to a level of specificity agreed-upon by contributors). This provides clear context to business message standards. These guidelines are expressed in one or both of the following ways:

- Written:
 - Business use cases of various levels of formality and detail
 - User stories/vignettes
- Diagrammatic:
 - UML activity diagrams
 - UML state diagrams
 - BPMN diagrams

To date, the most common use of the business process guidelines is to provide a solid starting point for discussions among a community of trading partners, and then of course between trading partner pairs. Rarely are business process guidelines viewed as standards, although the designation is frequently discussed.

Message Standards and Implementation Technologies

Ag eStandards: In the agriculture industry, AgGateway has partnered with OAG to develop and maintain Ag eStandards. These are business message standards that describe the structures and data types of business messages identified in the business process guidelines. These standards are in XML Schema form. Many message names follow the form object + verb. For example, *OrderCreate* and *InventoryActualUsage*. However, there are some message names that are only an object. For example, *Invoice* and *CertificateOfAnalysis*. Ag eStandards messages have a consistent structure with a header and body; and within the body properties, partners, and details.

Message Use Guidelines: Messages are defined for use in a specified context, where the context category is primarily process type (e.g., order-to-cash). However, messages are generally implemented in a context that is further defined by categories such as industry (e.g., agriculture, seed) and geopolitical (e.g., European Union, North America). AgGateway has facilitated processes to document how messages are used in these more specific contexts using specially formatted Excel files produced by CLICK, which is described next.

CLICK: Business managers and developers often need to comprehend message standards. There are XML Schema tools like oXygen XML and XML Spy, but these tools are perceived as expensive and too technical for business-level message browsing. In response to this issue, AgXML, CIDX, and OAG funded development of a tool for Ag eStandards that AgGateway uses called CLICK. CLICK is tool for:

- Exploring Ag eStandards, including
 - Structure
 - What structure/data is required, what is optional, and what may repeat
 - Data types, including internal code lists
 - List of messages an element is used in
 - List of parent elements for a given element
- Producing Excel expressions of messages (the ones used to document message use guidelines as described in the previous section)
- Producing sample instance documents
- Copying Xpaths

OAGIS 10: In 2013 OAG completed a four-year effort to produce its next generation eBusiness message standards, OAGIS 10. Among the many new features and capabilities is support for agriculture and chemical industry message requirements. OAGIS is much more flexible than Ag eStandards, and is a proven global, cross-industry standard. OAGIS has proven effective as a canonical for information exchange within companies. It has a steep learning curve, but those willing to persevere are positioned for years of eBusiness effectiveness.

OAGIS is a sophisticated message library. OAGIS messages are called Business Object Documents (BODs) and always follow the form verb + noun. For example, ProcessPurchaseOrder, and ShowInventory.

ISO 11783/10 with Extensions: AgGateway specifies use of the ISO 11783/10 with AgGateway-defined extensions for certain messages that support field operations.

Identifier Standards, Guidelines, and Implementation Technologies

AGIIS, GTINs, and GLNs: AgGateway provides an identifier directory service called the **Agriculture Industry Identification System (AGIIS)**. AGIIS provides identifiers and associated attributes for businesses, consumers and locations (using GS1's Global Location Numbers or GLNs); identifiers and associated attributes for seed license agreements; identifiers and associated attributes for some products/logistics units (using GS1's Global Trade Item Number).

Code Lists: Ag eStandards specifies use of ISO, UN/CEFACT, ANSI ASC X12 code lists.

AgGateway Platform: AgGateway is currently exploring a next-generation platform to support identifier and other reference data requirements for the agriculture industry. AgGateway envisions a solution that will modernize AGIIS in a way that provides support for new requirements and does so using a solution architecture designed for extensibility and incremental improvements.

Bar Code and RFID Guidelines: AgGateway has also developed and published bar code and RFID guidelines. GS1 provided valuable input into their development.

Transport & Routing Standards and Guidelines, and Implementation Technologies

Guidelines: In the agriculture industry, AgGateway has developed transport & routing guidelines for both ebXML Message Service Specification (ebMS) and web services. Standards and supporting technologies in this area are constantly advancing. AgGateway constantly considers how it can develop guidelines to keep pace. Technologies under consideration as the end of 2013 include reconsideration of WSDL use and RESTful web services.

NEXUSe2e: AgGateway financially contributed to the development of NEXUSe2e (also known as Ag eMessenger). NEXUSe2e is an open-source eBusiness messaging server that supports the ebMS and Web Services protocols. It has been implemented by a number of companies within the agriculture industry.

AgGlossary.org: AgGateway's Precision Agriculture Council released a glossary in 2014. The glossary team reached out to federal government agencies, state governments, academia, industry groups and AgGateway councils for input. In addition to the basic term/definition functionality, the glossary team implemented support for ontology development. The glossary can be found – and contributed to – at AgGlossary.org.

Reference Data Implementation Technology

In 2012 and 2013, the AgGateway SPADE (Standardized Precision Agriculture Data Exchange) project team worked on requirements for a reference data index. A reference data index provides

navigable/searchable paths to reference data sources, including identifier directories. Reference data is a critical complement to business message standards.

Further development of a reference data index requirements will continue in the SPADE Project, but in close coordination with AgGateway platform development.

Data Ownership and Privacy Guidelines

In 2014 AgGateway's Data Privacy and Security Committee published a white paper to help the agriculture industry consider ways to incorporate data privacy best practices and standards into their operations. The paper is also intended to provide recipients of farm data and their customers with areas to consider when using that data. The paper, which is publicly accessible at www.AgGateway.org, includes key terminology to encourage consistency across the industry.

The Data Privacy and Security Committee considers the white paper a living document that will continue to be updated given the issue's importance, especially as farmers create and use an increasing amount of data to better manage their operations.

Conclusion

This paper provides a starting point for agricultural companies interested in increasing their eBusiness capabilities, by laying out in general terms the value of eBusiness and the increasing trend toward adopting eBusiness practices; as well as some ideas on ways to begin incorporating eBusiness into corporate strategy. By reviewing fundamental aspects of eBusiness, the paper aims to provide something of a roadmap to help navigate further involvement and participation. Companies are encouraged to seek out further information and take advantage of the networking and educational opportunities offered by AgGateway and others. This is an exciting period for adoption of eBusiness practices, and an ideal time to become involved, to fully leverage the benefits of electronic connectivity in the challenging and ever-changing business of agriculture.