

EMERGE INTERACTIVE CASE STUDY

Executive Summary

This case study evaluates eMerge Interactive's management strategy considering the market environment. eMerge is a diversified technology company providing individual-animal tracking, food-safety, and supply-management services to the beef industry. Like many start-ups, eMerge has yet to have a profitable year, despite their state-of-the-art products that clearly have a place in the livestock industry. After thorough evaluation of market initiatives, government policies, and biological concerns in the livestock market, the reader is presented with questions regarding eMerge Interactive's position and future strategy. eMerge's target market is made up of livestock producers – many of whom are traditional and conservative and thus quite slow to adopt new products, especially ones incorporating new technology. The question is: How does eMerge stay afloat until the market is ready, and what can they do to increase the adoption rate of this new technology?

Introduction

David Warren sank back into his office chair with a great sense of satisfaction. He had just hung up the phone with Rich Stroman, Executive Vice President, and head of the VerifEYE Technology operations at eMerge Interactive. Another VerifEYE Solo HandScan unit had just been sold – this time to a processor in Great Britain. What a great way to start the day. Maybe this expansion into international markets would be the answer to all their problems; his mind was full of success and visions of international acclaim. As Chief Executive Officer of eMerge Interactive, a lot of weight had been resting on his shoulders for some time. Warren's excitement started to wane as he refocused on eMerge's current state. Why hadn't they been profitable? Last year they had almost \$1 million in sales, yet incurred a net loss of \$10 million. He knew eMerge couldn't survive like that for much longer.

The firm had state-of-the-art products on the cutting edge of the healthcare and foodservice industries. Why weren't they infusing the market like they should? This train of thought continued as he went back online to check the business news. He read the headline with a groan of frustration "Country Of Origin Labeling Delayed." They had invested so much time and capital into developing their livestock tracking technology, CattleLog, but the demand just hadn't met their expectations. With government mandated livestock traceability looming in the future, and the risk of food terrorism and other biohazards at high levels, eMerge management thought the CattleLog system would be a sure bet. "We just need to hang in there," David told himself as he started skimming the article.

Things had been looking good for the VerifEYE technology as it expanded into other areas such as hand hygiene and Specified Risk Material (SRM) detection, but how long would it be able to keep eMerge afloat? He really wanted to see the company do more than just keep its head above water. A knock on the door interrupted his silent brooding; this day's troubles

were enough to handle on their own. The ever-nagging concerns got pushed to the back of his mind as he headed off to his first meeting of the morning.

Company History

eMerge Interactive was incorporated as eMerge Vision in 1994. Originally part of its parent company, XL Vision, eMerge Vision developed complex imaging and infrared thermography systems, primarily for maritime use. The use of this technology led to several related applications, all dealing with the use of infrared cameras to detect non-visible temperature gradients.

Early trials with a stress-reducing feed additive known as Nutricharge had taken place. The former management team looked to several cattle data companies to manage the associated analytical and benchmarking functions required to evaluate this product. Two early eMerge acquisitions, Cattlemen's Information Network and Professional Cattle Consultants (PCC), were purchased in 1999 specifically to provide a data foundation that had not previously existed.

eMerge Vision's early management knew they had a unique opportunity to help cattle producers, but they needed a marketing outlet for these cattle. Their solution was to build a dedicated cattle marketing organization to supplement the data management products and Nutricharge feed supplement (a supplement designed to reduce the effects of stress on livestock). The first acquisition in this area was CyberStockyard, a leading online cattle marketing service.

In February 2000, at the height of dot-com mania, eMerge Interactive conducted an initial public offering raising \$135 million. These proceeds were used to fund three primary product areas: cattle marketing, an online store for agricultural products, and a feedyard information management system. Unfortunately, adoption of these products was slower than the management team anticipated and their plans never fully materialized. In May 2001, eMerge

discontinued its online store and halted development of many technical operations. In the fall of 2001, recognizing that the cattle operations were unprofitable, eMerge began to sell many of the order buying and cattle brokerage operations while retaining its Professional Cattle Consultant (PCC) division, Premium Sales, and CattleLog individual animal management tools.

Also in August of 2001, a new management team was installed that recognized the unique situation the company was in. While paring back the cattle and online operations, two products – CattleLog and the yet unnamed fecal detection tool – remained in the background. Successful trials and new opportunities continued to appear for these two products and they seemed to present the most potential of any products eMerge retained. The management team – this one with significant cattle industry experience - decided to pursue the commercialization of both product lines.

In February 2002, the efforts of the new management team began to pay off. The fecal detection system, now known as VerifEYE, was being integrated into meat processing plants through a signed developmental agreement. Also in February 2002, eMerge launched two new CattleLog programs, both intended to aid in creating branded beef supplies for their growing customer roster. In June 2002, a handheld version of VerifEYE was launched and received considerable interest in the U.S. and abroad.

Today, eMerge is divided into two business units: CattleLog and VerifEYE. Their mission is to deliver innovative technologies to new industries in a manner that creates new value for the industry and consumers.

eMerge has two main locations. Located near the Atlantic coast in *Sebastian, Florida*, eMerge Interactive's Corporate Headquarters coordinates the company's research and development, information technology, human resources, accounting, and VerifEYE marketing

and communications activities. The CattleLog business unit is based in **Fort Worth, Texas**, the focal point for all CattleLog sales, marketing, and customer support activities.

eMerge has a new management team, all of whom have been appointed in the last five years. These members are listed in Table 1.

Table 1: eMerge Management Team from 1999-2004
<i>David C. Warren-Chief Executive Officer</i>
David Warren was appointed CEO in September 2001. He has an extensive background in livestock management and animal health. Prior to joining eMerge, he served as President of Allflex USA, Inc., where his responsibilities included the formation and expansion of Allflex in the U.S., Canada and Mexico, and the development, adoption and growth of electronic ID systems for the cattle, swine and dairy industries in the United States.
<i>Robert E. Drury - Chief Financial Officer</i>
Robert Drury was appointed CFO in June 2004, having served as a member of eMerge's board of directors since June 2001. Before joining eMerge he was Chief Financial Officer for GCA Service Solutions, North America's largest food service provider, as well as Senior Vice President and Chief Financial Officer for Sodexo.
<i>Mark S. Fox-Executive Vice President, Information Technologies</i>
Mark Fox brings nearly 20 years' experience in software design, development and management to his position. He joined eMerge in March, 2000, to manage the development of the company's cattle-marketing network and website, the CattleLog individual-animal data-collection and reporting system, and web-based statistical reporting.
<i>Rich Stroman-Executive Vice President, VerifEYE Technology & Operations</i>
Rich Stroman joined eMerge in January 2000, with over 20 years of experience in the creation, development and commercialization of new products lines. Prior to eMerge, he served as vice president, general manager of Key/AgriVision and as director of development engineering at Key Technology, Inc., a world leader in the design and manufacture of optical inspection and material handling systems for the food processing and pharmaceutical industries.

A brief summary of events in eMerge's background are highlighted in Table 2.

Table 2: Historical Highlights

- Founded in 1993
- August 1999: Created partnership with Iowa State University and United States Department of Agriculture to develop leading-edge VerifEYE technology for detecting fecal contamination on beef carcasses.
- January 2000: Formed alliance with Southern States Cooperative, America's largest livestock marketing cooperative, to conduct cattle auctions through the eMerge network.
- February 2000: Announced Initial Public Offering of 8,000,000 shares of Class A stock, traded on NASDAQ under the symbol EMRG.
- June 2000: Introduced the eMerge Interactive Platform (eIP), a powerful, high-bandwidth business application, offering feedyards communications, and cattle-marketing solutions.
- January 2001: Completed acquisition of several cattle firms - Bluegrass Stockyards, J&L Livestock, Runnells Peters Stockyards, Pennell Cattle Company, Hefley Order Buyers, Robert Thigpen Livestock Co Inc., McMahan Order Buying Co, LeMaster Livestock, Inc., Mountain Plains Video Contract Auction service of Billings Livestock Commission Co., Jordan Cattle Auction, and Eastern Livestock Co
- May, 2001. Selected by Oklahoma Cattlemen's Association and Kansas' Beef Marketing Group to manage individual-animal tracking and marketing program.
- July, 2001. Received commitment for \$30-million line of credit from CIT Group.
- August, 2001. Advanced Fecal Detection technology for use in whole-carcass imaging system; University trials, in conjunction with USDA, confirmed efficacy of their technology.
- August, 2001. Formed strategic alliance with Allflex and FarmExpress to integrate and create global standard for individual-animal tracking and industry-wide procurement system.
- September, 2001. Selected by Five States Beef Initiative for electronic, individual-animal data-management initiative throughout Kentucky, Ohio, Indiana, Michigan and Illinois.
- November, 2001. Chosen by Ranchers Renaissance for electronic, individual-animal tracking and data-management services.
- February, 2002. Joined leading U.S. beef processor Excel in production-development agreement for new meat-inspection system using VerifEYE.
- June, 2002. eMerge decides to divest its cattle operations and reduce corporate overhead by 25%.
- July, 2002. CattleLog Pro is launched. Designed to help cattle operations of any size process-verify and "de-commoditize" individual animals.
- July, 2002. Receives first order for 17 VerifEYE handheld meat-inspection devices from Excel Corp.
- June, 2003. Nation's top five beef processors select eMerge's VerifEYE handheld (Solo) device as food safety tool.
- August, 2003. ATTEC Food Technology Ltd. , (United Kingdom) purchases VerifEYE Solo, -- eMerge's food safety technology enters European beef industry.
- September, 2003. Argus Realcold Ltd. selected as distributor of VerifEYE Solo in Australia and New Zealand.
- September, 2003. Excel acceptance of first VerifEYE Carcass Inspection System in its North American beef plants signals start of revenue stream from licensing program.
- September, 2003. eMerge begins development of human hand infection control scanning device with potential applications in restaurants and other food-service facilities.
- September, 2003. Montana Beef Network selects CattleLog as data provider.
- November, 2003. Excel Corp. accelerates three-year lease – eMerge receive \$3 million.
- November, 2003. Kyokuto Boeki Kaisha appointed distributor for VerifEYE products in Japan.
- January, 2004. USDA approves CattleLog animal tracking system as a Process Verified Program.
- January, 2004. ADM (Archer Daniel Midland) Alliance Nutrition, Inc. selects CattleLog to manage their data collection, analysis and information exchange, offering CattleLog to cattle producers who purchase ANI's feed and feed supplements.
- February, 2004. Launches formal development program to expand VerifEYE technology for use in detection of spinal tissue in meat processing industry. (Commercial product testing beginning mid-2004)

Financial Overview

eMerge has yet to have a profitable year. Evaluation of financial statements (Appendices A and B) reveals that they have had some years of very high revenue along with other years with much smaller revenue.

eMerge stock prices have also suffered. Within the last year alone, prices have fluctuated from over \$2.00 to less than \$1.00. After the initial public offering in 2000, the stock price was very high (ranging from \$30-\$70) but suffered soon after with the general market decline in internet and technology stocks. However, by 2002, the stock had fallen to less than \$1.00, where it remained until the end of 2003 when Bovine Spongiform Encephalopathy (BSE) was discovered in Washington State. This incident caused many to believe that mandatory identification of livestock would soon become a reality and eMerge's stock prices peaked at over \$3.00. More than a year has passed since that incident – livestock identification is still not required and stock prices have returned to the \$1-\$2 range. (See Appendix D).

From 1999 – 2001 eMerge was involved in many different products that have since ended including e-commerce, NutriCharge, and Interactive Manager. Millions of dollars had been put into the products before they were discontinued. This was very harmful to the financial viability of eMerge as well as its reputation in the industry. The scale of operations has shrunk in recent years as the livestock marketing venture ended and management has focused on the VerifEYE and CattleLog business units.

CattleLog



CattleLog is the name for a suite of products and services designed to allow producers to capture and analyze individual animal data. These products include data collection software that operates on a user's PC and a separate online data reporting service that allows producers, feeders, and packers to view and analyze data collected on individual animals (that may have come under their control during some point in the production process) at all stages of production (Table 3). The program fits into a number of cattle processing and data collection scenarios; from high-volume cattle processing in feedyards to detailed ranch data collection.

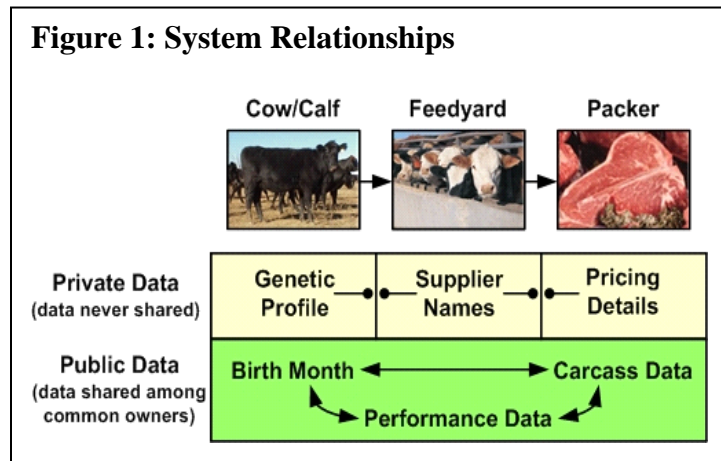
Table 3: CattleLog Attributes

Cattle Tags: operates with electronic identification tags (EIDs) and visual identification tags (VIDs)
Real-Time Calculations: real-time, individual Average Daily Gain (ADG – the pounds gained by an animal per day averaged over time)
Sorting: Weight- or ADG-based sorting
History: Displays historical data
Speed: Highest collection speeds in the industry
Simplicity: Over 100 local and online reports

eMerge Data Services is the other data collection option. Designed for smaller or seasonal users, it revolves around a service where customers are mailed electronic Identification (EID) tags and customized worksheets. When cattle are processed and data recorded, the worksheet is returned to CattleLog for entry into the CattleLog database. No computer or internet access is required to use CattleLog Data Services.

CattleLog was built around a series of data sharing standards that allow all CattleLog users to have access to useful information while protecting confidentiality and market relationships. Traditionally, cattle producers have only had access to the data they collect and know little about the cattle before or after they have them in their possession. With CattleLog, information is available via a secure, anonymous data sharing platform. Producers may use this information to make better management decisions to meet their goals in a more timely manner.

Figure 1 depicts the type and nature of data that would be submitted for an animal by each of the three main supply chain groups: the cow/calf producer, the feedyard and the packer.











CattleLog separates the

data into public and private fields. **Private data** is sensitive data that is available only to the person who submitted it. No one else would ever have access to that data. **Public data** tends to be less sensitive and is available to any entity that submitted data on that particular animal. Examples of public data fields would be weights, vaccinations, implants, ADG, etc. The general public would never have access to any of the information in the database.

The program is divided into two sections, collection and reporting. The list prices are shown below.

- Collection:
 - CattleLog Pro software \$695
 - If collecting weights automatically, add \$45-120 for a serial-USB adapter
 - CattleLog Data Services \$.25/head entered for the lifetime of the animal
 - See Table 4 for different data collection devices
- Reporting:
 - CattleLog Data Fees \$1.25/head for full data
\$.50/head age and tracking only

Data fees are **per owner for the life of the animal** and discounted rates, payment plans, and annual fee plans are all available. Hardware used to collect the data is displayed in Table 4.

Table 4: System Hardware	
Allflex Single Use Electronic Identification (EID) Tag	
Allflex Reseumatique Reader - Designed for portability and durability, it utilizes a rechargeable battery and can transfer ID numbers to a laptop or properly equipped cattle scale through an RS232 port (using an electronic connection).	
Allflex Stick Reader - This portable reader is capable of reading Allflex High Performance EID tags. Uses either a 6 or 12V battery or AC power. The unit has no display panel, but will hold up to 1,800 EID numbers in memory for subsequent downloading and is compatible with several different scale heads. Comes complete with AC power source and a battery cable.	
Allflex Panel Reader - Used primarily in packing plants where high speed, automated systems are needed. It is designed to give the user the greatest possible read range (up to five feet) in the packing house environment. It is also used in some processing chutes where the cattle will walk by it.	
Allflex Portable radio frequency identification (RFID) Reader - designed to verify that a tag or implant is working and to display the ID number.	
Allflex Wand Reader - The standard in feedyards and used where large numbers of animals are processed at one location, it requires 110v power and can transfer ID numbers to any type of computer or properly equipped scale.	
AgInfoLink Tag Tracker - is a hand-held wireless RFID reader that is built for durability. The TagTracker™ reader reads an RFID tag and communicates with a base station connected to a PC computer that can sit over 100 feet away.	
Temple Tag Electronic Identification Tag	
Temple Tag/Destron-Fearing 2001 Portable Reader	

eMerge's CattleLog system was the first and only data service provider whose information management product was approved as a USDA Process Verified Program (PVP). CattleLog first received approval in December 2003. The most recent USDA audit was conducted in June 2004. CattleLog successfully met the program requirements and was subsequently recommended for a twelve-month approval, the maximum approval period. Livestock producers are looking for data service providers they can put their trust in for business solutions. By having approval as a USDA PVP, they can be assured that their information is safe, secure, and accurate. (eMergeinteractive.com)

The USDA PVP provides suppliers of agricultural products or services the opportunity to assure customers of their ability to provide consistent quality products or services. USDA PVP producers are able to make marketing claims -- such as breed, feeding practices, or other raising and processing claims -- and market themselves as a "USDA Process Verified Program." The USDA PVP does not relieve the supplier of meeting regulatory requirements issued by other Federal Departments or USDA Agencies. To operate an approved USDA PVP, suppliers must submit documented quality management systems to the Livestock and Seed Program, Audit Review and Compliance (ARC) Branch and successfully pass an audit according to the ARC Procedures.

There are a number of companies that provide EIDs and data collection services. Four of eMerge's most direct competitors are outlined in Table 5.

Table 5: Competitor Profiles

APEIS Corporation - Animal Permanent Electronic Identification System (APEIS) has developed the Trax series (BEEFTrax, CattleTrax, and others) of animal identification and record management products. They provide permanent identification of individual animals using RFID which tracks all aspects of the animal throughout its life using an internationally web accessible database, and provides reports for herd management ([Apeis Corporation](#), 2004).

IMI Global Inc. - IMI Global creates customized integrated livestock software that helps customers be more profitable. Since 1995, IMI Global has been providing technology solutions to America's livestock organizations. They provide a comprehensive system covering data collection software and real-time processing systems along with analytical tools. IMI Global also allows producers to easily access all paperwork needed for livestock transport and sale as well as calculate marketing opportunities and receive weekly market updates (IMI Global, 2004).

Micro Beef Technologies Ltd. - Micro Beef Technologies have been providing cattle solutions for traceability and food safety since 1971. The ACCU-TRAC® Electronic Cattle Management System (ECM) and components are in use in commercial feedyards, ranches, and packing plants. This technology allows integrated beef production with individual animal tracking and management from birth to box. It does so cost-effectively, solving problems associated with group management based on averages ([Micro Deef Technologies](#), 2004).

AgInfoLink USA - Founded in 1997, AgInfoLink designs and develops traceability tools as well as data collection, secure data transmission, data warehousing, reporting and analysis tools. They provide farm to table computer based tracking. AgInfoLink's technology solutions allow agribusinesses to collect, transfer, share, extract, transform and report on information from individual units of production throughout the entire food supply chain (AgInfo Link, 2004).

Benefits of Branded Beef

Many believe that the drive for traceability will encourage producers to establish a brand label for their product that can be backed up by a brand promise -- and thus provide a premium price. This could revolutionize the cattle industry. Consumers tend to trust brands due to assurances that the product has specific qualities they desire. Attributes that may be promoted are traceability, tenderness, nutritive value, food safety, excellent taste, and production practices that are humane and environmentally sustainable.

CattleLog is already being used to provide consumers with brand name beef products. Safeway's Ranchers Reserve is provided by the Ranchers Renaissance Cooperative out of Colorado. This brand of beef products can also be found at food retailers Vons, Pavilions, Carrs, and Dominicks. They promote this product as being hand trimmed and selected and tracked to

“ensure each cut meets strict standards for quality and tenderness.” (Ranchers Reserve, 2004)

John Butler of Ranchers Renaissance said their goal was to have a software system that would link the ranch to the feedyard and then to the processing plant. The system has allowed them to track the cattle from a number of producers all the way through the packing plant, providing them the ability to promote a branded product. One reason that branded meat products have been such a slow growing movement is because it takes time and effort on the part of the producer. More is required than simply putting an ear tag in the cow or steer. There are numerous management decisions that influence the profitability of any producer. “These systems are a tool -- not a solution,” Butler has said. “When used smartly they will benefit your operation, but they are only one part of the solution.” (Butler, 2004).

Traceability Concerns

The discovery of a dairy cow in Washington State with Mad Cow Disease in 2004 generated a great deal of interest in technology for tracking cattle and other livestock in the United States. Dale A. Blasi, professor and beef specialist at Kansas State University, says radio frequency identification (RFID – discussed in more detail below) will eventually be used to track every domesticated animal from traditional livestock to the family pet. But it will take several years because a number of issues need to be resolved, including data privacy, the potential liability of those who raise the animals, and the cost and performance of RFID tags and readers (RFID Journal, 2003). The World Trade Organization (WTO) has indicated that meat exporting nations may be required to meet importing nation’s domestic identification and traceability standards. The CattleLog system is one such database that can provide the framework for a traced beef product enabling U.S. suppliers to comply with traceability requirements around the world.

The beef market is very dynamic. Two main reasons of interest are, (1) it is strongly influenced by governmental policy on food safety and trade policy, and (2) there are biological hazards in the form of diseases that can be harmful to cattle herds and also to humans. Some of the current issues facing the cattle industry are: Country of Origin Labeling (COOL), the drive for branded products, the threat of Bovine Spongiform Encephalopathy (BSE), Hoof and Mouth Disease, and Tuberculosis. When the source of disease contamination can be established and the exposed animals can be treated, the spreading of disease will more easily be controlled. Products like eMerge's CattleLog system can help livestock producers prevent outbreaks and spread of disease, thus increasing the efficiency of their production and the safety of the nation's food supply.

Radio Frequency Identification Devices

Radio Frequency Identification Devices (RFIDs) are tiny microchip computers (as little as 1/3 of a millimeter across) that cost as little as \$.25. They transmit and receive radio signals and have their own built-in power source, which could theoretically last up to 100 years (Dixon, 2004). When a chip receives a certain radio query, it responds by transmitting its unique code, perhaps a 128-bit number, back



to the receiver (Granneman, 2003) (Figure 2). This RFID technology has been modified slightly into the form of livestock ear tag (approximately the size of a quarter) to be used in cattle and costs a little over one dollar. The smaller chips, which may be used to implant pets or track merchandise, are not yet used on livestock. Once the chip is implanted in the animal, it in essence becomes part of the food-chain, and therefore needs FDA approval before use is

permitted.

It will take time for the infrastructure to be built to support RFID tracking. While tags and readers have been around for some time, there hasn't been a lot of software designed specifically for certain segments of the cattle industry, such as stockers and backgrounders, which prepare young calves weaned from their mother for large feeding facilities.

"The average breeding herd size in the U.S. is less than 40 head," says Dale A. Blasi, professor and beef specialist at Kansas State University. "Not everyone has the equipment to restrain the animal when the tag or transponder is applied in the ear. Moreover, not everyone will require a reader for use day to day within their operations. There will likely be tagging facilities at auction markets to apply the transponder, when a small farmer wants to sell an animal." (RFID Journal, 2003).

"Things are coming together," says Blasi, "Wal-Mart is adopting RFID, and Wal-Mart happens to be the largest retailer of beef. It makes sense to integrate the food supply chain from end to end, and I think it will eventually happen. The challenge will be to make it a win-win situation for the producer and the consumer." (RFID Journal, 2003).

Wal-Mart is indeed moving in the direction of RFID use; replacing the bar code system. By January of 2005, 100 of Walmart's major suppliers will be required to be using RFID. "Bar codes have transformed the way we all do business," said Mike Huke, president and CEO of Walmart Stores Division (USA). "RFID will not just transform how *we* do business, but will revolutionize how we *all* do business. I don't think we can even imagine all the benefits that it will deliver." (Roberti, 2004)

eMerge too saw the benefits of putting RFID technology to work. Using the existing technology, they developed a collection program and advanced database that allows producers

and processors across the world to not only trace their livestock, but also collect data on their livestock for management purposes.

U.S. Animal Identification Plan

The U.S. Animal Identification Plan (USAIP) defines the standards and framework for implementing and maintaining a national animal identification system for the United States. These standards will apply to all animals **in commerce** within the represented industries, regardless of their intended use as seedstock, commercial, pets or other personal uses. Having a working system that allows for traceback to all premises that had direct contact with a diseased animal within 48 hours of discovery will reduce the financial and social impacts of such a disease. Only state and federal health officials will have access to the premises and animal ID information, when performing their duties to maintain the health of the national herd.

The plan is being developed as an industry-government partnership, so it is expected that industry and the government will share the cost of the necessary elements. The National Animal Identification Development Team, which has developed the USAIP, is a group of approximately 100 animal and livestock industry professionals, representing over 70 associations, organizations, and government agencies. eMerge has a member on this development team (USAIP, 2004)

The aim of the plan is to help safeguard the health of the cattle in the U.S. and to protect and enhance international trade. The draft suggests that U.S. states create a system of assigning numbers to each premises and maintain a registry for identifying each individual location where all cattle and other domestic animal species are kept. The plan currently covers all domestic cattle, bison, swine, sheep, goats, deer, elk, llamas, alpacas, equine, poultry, game birds, ostriches, emus, and aquaculture.

Animal owners would check with the USDA and their State's Department of Agriculture to acquire a unique premises ID for each location where animals are kept. Each time an animal is sold or transferred to a new location, the animal's ID must be associated with the new premise number in a database. Animals entering the country will be subject to the same identification requirements as animals in the U.S. that move interstate and/or through commerce (USAIP, 2004). This will allow regulators or investigators to trace each animal back to its source quickly and identify other animals that may have been exposed to the same disease (RFID Journal, 2003).

Currently the distribution mechanism for ID devices is being discussed. It has not been decided where and how a producer can obtain official ID devices at this time. Different species will have different requirements with regards to the type of device that can be used. However, standards in regards to RFID technology, and code structure, and retention will insure that various ID devices can be read with RFID readers that meet the same RFID technology standards.

The USAIP work plan recognizes that not all producers will have facilities to individually tag animals before they leave the farm. For such producers there will be tagging stations operating at fixed locations that have been officially approved to apply ID devices. Such tagging stations may include existing livestock marketing facilities, veterinary clinics, fairgrounds or facilities specifically dedicated to performing tagging services.

Once the USAIP has been finalized, considered workable and accepted by industry, it is likely that industry and market forces will drive the process towards full compliance. At that time, the USDA will work with industry and state partners to achieve full participation with the USAIP (USIAP, 2004). eMerge is not waiting for the USAIP to be fully implemented and

traceability to be required, rather they are pushing ahead with a market-first strategy, believing market-driven adoption will be much faster than a legislatively mandated, government adoption. If USAIP happens, they will have an instant market with thousands of potential customers. They are working to position themselves as a leader in the industry, so when this market is created, they will have an edge over their competitors.

Country-of-Origin Labeling

Mandatory COOL was included in the 2002 Farm Bill, enacted May 13, 2002. COOL encompasses all fresh beef, pork, lamb, veal, seafood, produce and peanuts. Products that are ingredients in a processed food item are exempted from the law. On January 27, 2004, President Bush signed Public Law 108-199, delaying the implementation of mandatory COOL for all covered commodities (except wild and farm-raised fish and shellfish) until September 30, 2006 (Agricultural Marketing Service, 2004). The U.S. Department of Agriculture(USDA), Agricultural Marketing Service (AMS) branch is responsible for regulating and enforcing mandatory country-of-origin labeling. The costs will be shared by producers, packers, retailers and consumers in the form of higher food prices.

To qualify for the label, "Product of the U.S.," meat must be derived from animals born, raised and slaughtered in the U.S. Otherwise, meat products must indicate where source livestock were 1) born, 2) raised and 3) slaughtered. One such label is displayed in Figure 3. U.S. cattle producers import a significant number of Mexican feeder cattle, which are raised and slaughtered in the U.S. In the case of ground products, meat from several countries may be blended together. These products must bear labels that indicate the source countries in descending order of predominance by weight (Country of Origin Label, 2004).

Figure 3: Sample COOL Label



Source: Country of Origin Label, 2004

eMerge’s CattleLog system is designed to provide the necessary information and services to fulfill the requirements of programs such as COOL. Once all livestock producers and processors are required to provide proof of origin, they will likely need an electronic tracking system. Political power is wielded heavily by different agricultural groups. Ranchers-Cattlemen Action Legal Fund (R-CALF), is a cattle producers’ association that is favorable towards COOL and traceability requirements and is pushing for such legislation. However, the American Meat Institute, the trade organization for meatpackers, has long opposed labeling mandates (Schuff, 2004).

There are literally hundreds of producer and trade groups on both sides of COOL with concerns ranging from costs, to national security, to privacy issues. U.S. President George W. Bush postponed Mandatory COOL two times in his first term, substituting a voluntary program.

The future of COOL hinges on political decisions. As with the USAIP, COOL would create a favorable market environment for CattleLog. eMerge believes that passing mandatory COOL could create additional revenue opportunities, helping pull them out of their profitless past into a future of high returns.

Livestock Disease Control

Bovine Spongiform Encephalopathy (BSE), also known as “Mad Cow Disease”, is a progressive, fatal neurological disorder of cattle. It is characterized by holes in the brain as the brain deteriorates. Although the source of the BSE epizootic agent is uncertain, feeding cattle BSE-contaminated meat and bone meal is the major contributory factor to the spread of BSE among cattle. Since 1986, BSE cases have been identified in 20 European countries, Japan, Israel, Canada, and the United States. (Center for Disease Control and Prevention, 2004)

Concern over a possible link between BSE and the human disease Creutzfeldt-Jakob Disease (CJD) led to a significant loss in consumer confidence in beef throughout much of Europe. The BSE Timeline (Table 6) provides a quick summary of BSE occurrences and dates. Between November 1986 and July 2001, more than 178,000 head of cattle in over 35,000 herds were diagnosed with BSE in Great Britain (Animal and Plant Health Inspection Service, 2004). Canada confirmed its first case of BSE on May 20, 2003. The U.S. closed the border to live cattle and beef imports from Canada and the Canadian government conducted an exhaustive investigation that turned up no additional cases.

On December 23, 2003, the USDA made a preliminary diagnosis of BSE in a non-ambulatory, disabled dairy cow in Washington State. The BSE-positive cow was 6.5 years old when it was slaughtered on December 9, 2003. When the presumptive diagnosis of BSE was made, the herd to which the cow belonged was placed under a state hold order. The USDA, in

collaboration with state and other federal animal and public health agencies, industry representatives, and the Canadian Food Inspection Agency (CFIA), initiated investigations of potentially exposed cattle and regulated products (BSE Info Recourse, 2004). Not all the animals associated with the diseased cow were found. The manual traceback systems in place at that time were not sufficient for such a recall.

Table 6: BSE Timeline	
November 1986	BSE is first diagnosed in the U.K.
1990	USDA initiates a surveillance program and begins testing for BSE in cattle showing signs of possible neurological disease.
January 1993	BSE epidemic in U.K. peaks with 1,000 new cases reported per week.
March 20, 1996	British government announces possible link between BSE and 10 cases of a human disease called Creutzfeldt-Jakob Disease (nvCJD).
October 3, 1997	FDA rule banning the use of high risk mammal-derived protein by-products in bulk and bagged animal feed for cattle becomes effective.
September 2001	first case of BSE found outside of Europe is reported in Japan
May 20, 2003	Canada confirms first indigenous case of BSE in a single 6-year old Alberta beef cow. The U.S. closes the border to live cattle and beef imports. The Canadian government conducts an exhaustive investigation that turns up no additional cases.
December 23, 2003	USDA announces a single case of BSE in Washington state in a 6 ½-year-old dairy cow. The cow originated in Canada. USDA/APHIS launches an exhaustive investigation that ultimately involves more than 75,000 animals on 189 premises and initiates a beef recall.
December 23, 2003- December 31, 2003	Fifty-three countries ban imports of US beef and beef products.
October 26, 2004	Japan approves the use of Process Verified Animal Identification and Data Collection Services to document age verification to allow the resumption of trade of beef and beef products between the U.S. and Japan.
Source: BSE Info Resource	

Foot and Mouth Disease (FMD) is another highly contagious and economically devastating disease of cattle and swine. It also affects sheep, goats, deer, and other cloven-hoofed (split-toed) ruminants. FMD causes severe losses in the production of meat and milk. Because it spreads rapidly and has grave economic, as well as physical consequences, FMD is one of the most dreaded animal diseases (South Dakota Department of Agriculture, 2004).

FMD has a morbidity rate of almost 100% (all animals who are exposed to the disease will become ill), however, the mortality rate of the disease is typically less than 2% (Firkins, 2004). Although most animals recover, they do not return to normal productivity and do remain carriers. The virus spreads very easily and rapidly through air, land, over water, on human clothing, and through animals. The U.S. has been FMD free since 1929 and Canada and Mexico have been clean since 1954. FMD can be prevented by prohibiting the importation of animals and animal byproducts from infected countries (Firkins, 2004). The devastating nature of this disease deems it worthy of attention. With traceability technology, infected or exposed livestock could be quarantined much faster and quarantine areas could be much smaller, preventing an unnecessary interruption of all of agriculture.

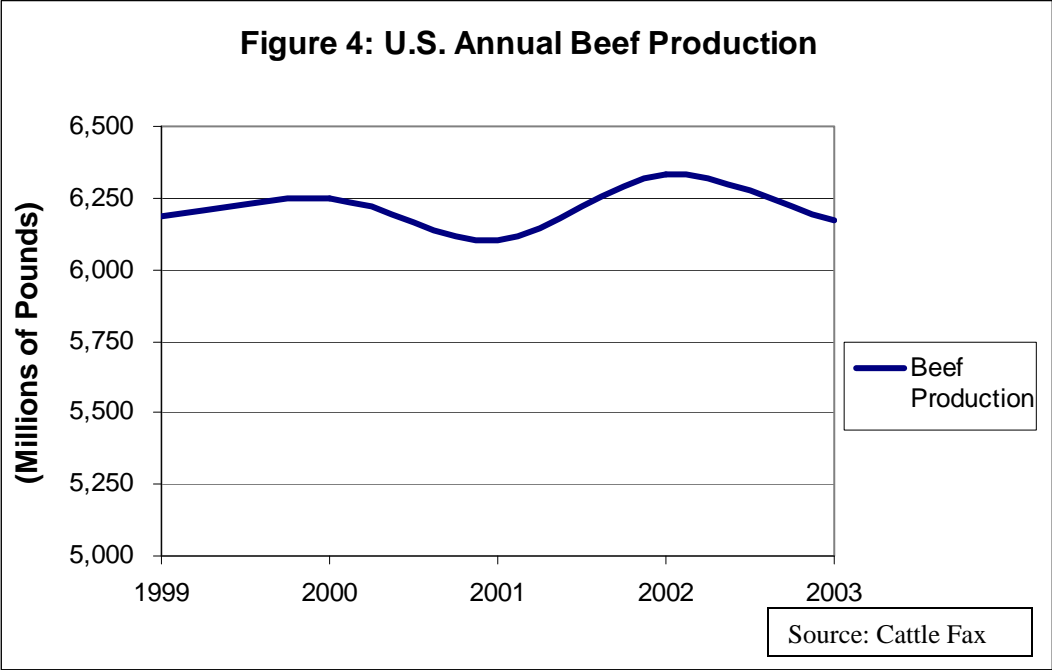
Tuberculosis (TB) is also a serious disease caused by several bacteria of the *Mycobacterium* (*M.*) family that mainly affects the respiratory system. Three main types of TB and their causative agents are: human, avian, and bovine. Bovine TB is the most infectious type, infecting most warm-blooded animals, including humans. It is this type which has infected deer and other wildlife. Farmed cervids (deer and elk) are especially susceptible to this type.

Bovine TB is a disease spread primarily by close contact with infected animals (airborne exposure from coughing and sneezing) and made worse by crowding and stress. Bovine TB is typically a slow, debilitating type of disease that can have a long incubation period. Animals that become infected may live and potentially spread the disease for years. Therefore, this is an increasing threat that must be monitored. When TB has been discovered in a bovine herd, the entire herd is depopulated. (Michigan Bovine TB Activities Report 1999).

Beef Industry Situation

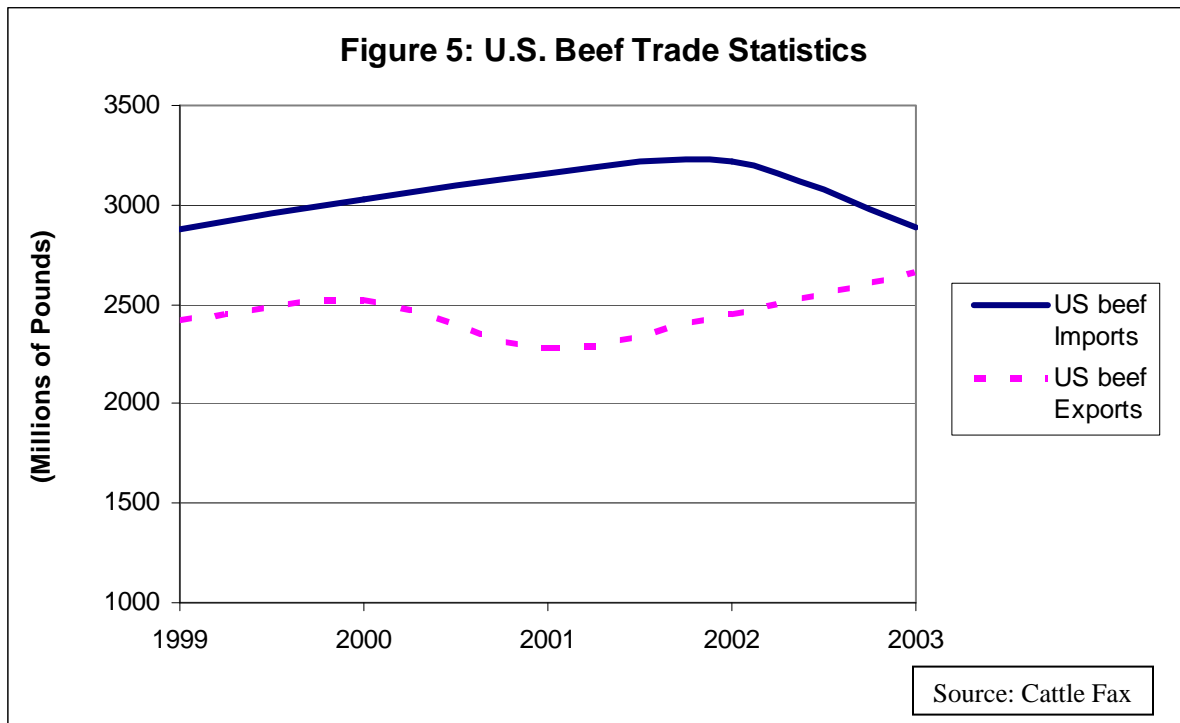
The U.S. beef industry is a \$95 billion annual market. The production side comprises \$34 billion in cattle sales and \$6 billion in feed, medicine and other goods. The industry is highly fragmented and geographically dispersed, with 850,000 producers, 700 feedlots and 70 packers nationwide breeding, raising, feeding and harvesting 34 million cattle annually. This fragmentation causes information loss, reduced beef quality and safety as well as harvest loss. It also means that these industry participants operate in information vacuums and with inherent inefficiencies resulting from excessive animal transportation and handling (eMerge Interactive).

Figure 4 shows that U.S. beef production has fluctuated over the past 4 years, but remains at high levels.



Exports play a very strong role in the American cattle industry. The export market has become increasingly strong in recent years (Figure 5), however, this changed dramatically in December of 2003, with the discovery of the case of BSE in Washington State. Many countries subsequently banned U.S. beef imports. This emphasized the importance of traceability not only

to food safety, but also for market security. The European Union began identification and traceability in 1998, and in 2001 Canada, Australia, New Zealand, and Japan all launched similar programs.



As shown in Tables 7 and 8, trade is becoming increasingly important and the regulations of these markets cannot be ignored. Before the occurrence of BSE in the U.S., Japan was the largest export market for U.S. beef. The three countries from which the U.S. imports most of its beef are already in the process of implementing traceability programs, potentially offering U.S. consumers branded products. Australia, New Zealand, and Canada are very important to eMerge's management discussions in a number of ways. These countries are challenging U.S. producers not only for domestic consumers, but also for many international markets. U.S. producers may need to be ready with traced and value added products to compete for these foreign markets. The fight may also take place in the grocery stores of the U.S. eMerge may find

a new segment of customers in these foreign countries, if the U.S. established traceability requirements are to be met by importers.

% of exports	Japan	Korea	Mexico	Canada	Other	Total Exports (000 lbs)
1999	46	13	19	10	12	2,417,115
2000	44	16	21	10	8	2,516,271
2001	44	15	23	10	7	2,270,727
2002	32	24	26	10	8	2,447,323
2003	33	23	23	9	11	2,658,215

Source: Cattle-fax

% of imports	Australia	New Zealand	Canada	Brazil	Argentina	Other	Total Imports (000 lbs)
1999	30	20	33	7	5	5	2,873,688
2000	34	21	30	6	4	5	3,031,842
2001	36	20	31	5	3	4	3,161,395
2002	35	19	34	6	3	3	3,217,658
2003	38	24	25	7	3	2	2,886,638

Source: Cattle-Fax

With annual beef consumption on the rise, domestic consumers may be looking to new beef products to supplement their normal diet. They may increasingly want to pick a brand that is their favorite and guarantees them quality. When consuming a product on a more regular basis, consistency could become a larger issue.

VerifEYE



The slaughter process for cattle and other animals involves the removal of pathogenic bacteria-free meat from between two contaminated surfaces – the hide and the gastro intestinal tract. All healthy muscle and organ tissue within an animal is bacteria free until slaughter, when it may be contaminated by outside sources. Even with high levels of caution, this process will inevitably transfer some bacteria onto the carcass. The goal of food safety programs is to

minimize this contamination and effectively remove the contamination that does occur. There are many methods used to control these bacterial contaminants, yet even using a combination of methods does not guarantee a safe product. Regardless of the many efforts to eliminate the incidence of illness and death caused by food-borne pathogens, outbreaks of bacteria-related disease still occur every year. These outbreaks cause 76 million illnesses and 5 thousand deaths each year, and according to the USDA Economic Research Service (ERS), cost the country \$6.9 billion in medical costs, productivity loss, and premature death. (Meat International, 2003)

In the fall of 2002, the USDA issued a directive calling for beef slaughter plants to reassess their Hazard Analysis and Critical Control Points (HACCP) plans. If at slaughter, *E. coli* O157:H7 or other bacteria are a hazard “reasonably likely to occur”, an intervention at the point of slaughter must be established. There are a number of different measures that can reduce the likelihood of *E. coli* being present on the carcass. These measures are applied to a carcass after slaughter. However, many of these measures are quite costly. eMerge’s VerifEYE technology allows for a means of detection and reduction of the organic contaminants that carry *E. Coli.*, along with other bacteria, that can contaminate a beef carcass (Buege, 2003).

In the mid-1990s, microbiologists with USDA’s Agricultural Research Service and a chemist from Iowa State University applied fluorescent spectroscopy to identify fecal contamination on cattle carcasses. While others have applied light reflectance to address this food safety issue, the researchers were the first to develop a system that measures radiated light from a surface exposed to laser-induced light of specific wavelength. By shining a blue light on the carcass, the chlorophyll emits a red light. This indicates that animal excrement or ingesta has contaminated that carcass (Meat International, 2003).

The patented VerifEYE Food Safety Technology is a unique machine vision technology

that instantly detects microscopic levels of organic contamination, which can potentially harbor pathogens such as E. coli 0157:H7, salmonella, Listeria, Hepatitis A and others. There are no products that directly compete with the VerifEYE carcass inspection system. It is a very specific instrument where most other methods of eliminating bacteria are very broad approaches such as lactic acid, hot-water wash, or steam washing systems (Stroman, 2004). The targeted approach of the VerifEYE system increases efficiency and eliminates the chemical treatment of meat that is not contaminated.

Figure 6: VerifEYE CIS



The VerifEYE Carcass Inspection

System (CIS) (Figure 6) uses a combination of light at specific wavelengths and advanced electronics to scan beef carcasses and display images on a nearby monitor. Any areas of suspected contamination are immediately apparent in these images, alerting workers of the need for further trimming. The technology may also offer some fringe benefits for its users. Because it creates such a detailed display of the areas of contamination, workers can trim with more precision and reduce waste from over-

trimming. The worker uses the image showing the contaminated areas as well as a handheld device (Figure 7) to check that the contamination was fully removed (Meat International, 2003).

The system also allows packers to collect the carcass scan data which can then be used to refine processes to improve performance and reduce the amount of contamination that comes into contact with the meat surface. The archived images of the contaminated carcasses

from the CIS can be used to improve the management of the skinning line (Meat International, 2003).

Figure 7: VerifEYE Solo Hand Unit



The VerifEYE Solo handheld unit sells for \$9000.

The carcass system is “lease-only” and costs are on a production basis. For a plant that processes over 1 million cattle annually, the system costs approximately \$400,000 per year and decreases as the production volume decreases. eMerge chose this method of pricing because the VerifEYE CIS is a work-in-progress. With the lease contract comes the assurance that processors will always have the most

recently updated system. It is a warranty of non-obsolescence to the processor as system improvements are made. (Stroman, 2004).

The VerifEYE technology is available in several applications for the meat and food processing industries. Additional products are being developed for the food service, healthcare and childcare industries. eMerge is working directly with processors and distributors to facilitate the marketing and distribution of their technology.

Food safety is often considered a buzz-word for everything from microbial interventions to hand-washing and hygiene programs. Whether food safety efforts take place in the meat processing plant, further processor or food service/restaurant levels, the primary challenge is to remove or control dangerous bacteria and pathogens carried by organic contamination.

VerifEYE Food Safety Technology provides the ability to detect microscopic levels of organic contamination on everything from raw meat to processing equipment and the utensils used to prepare the meat (eMerge).

eMerge interactive holds the exclusive license for this technology. In 2001, testing of a prototype was completed at Oklahoma State University and the University of Florida. By spring 2002, eMerge was working with Excel Corporation, a red-meat packing company recently renamed Cargill Meat Solutions, for final in-plant development of both carcass and handheld versions of this meat inspection system. (Meat International, 2003)

Based in Wichita, Kansas, Excel is a leading processor of fresh beef, pork, turkey, and fully prepared meats that are sold around the world. They have been very involved with the development of the VerifEYE technology and were the first to adopt the whole carcass system.

“It’s one thing to develop technology to enhance food safety,” says Matt Osborn, the company’s Project Leader for Research and Development. “It’s quite another to integrate that technology into existing production processes without compromising workflow efficiency.” One of the aspects that pleases Excel management the most is the fact that the system is user friendly and simple (Meat International, 2003).

With processing facilities and sales offices in the U.S., Canada, and Australia, along with business offices in Australia, China, Honduras, Japan, Korea and Taiwan, Excel employs over 30,000 people in eight countries. In 1979, Excel was purchased by Cargill, was incorporated, and became a wholly owned subsidiary. Cargill is an international processor, marketer and distributor of agricultural, food, industrial and financial products (Excel Corporation, 2004).

Excel allows eMerge to bring prospective customers into their plants to see the system in action. The meat processing market is a very small market, with less than 100 major players and information is shared very freely. When it comes to products that can protect people from contaminants in their food, the industry is willing to share what they know (Stroman, 2004).

Excel has come to view VerifEYE CIS as an extra layer of protection and safety for their

products. Christian Perversi, a research and development food scientist with Excel commented that it is very hard to quantify the costs and benefits of such a system. The savings on trimming are difficult to calculate, as are the expenses avoided in *possible* recalls and bad press. Excel is not using the VerifEYE system for its monetary perks, but rather sees it as a way to enhance the safety of their product, thereby justifying the cost of the system (Perversi, 2004).

Another strategic alliance was developed in late 2004 with Mettler-Toledo. On August 10th of 2004, eMerge signed a memorandum of understanding with Mettler-Toledo's Safeline Metal Detection division outlining a future relationship that incorporates collaborative distribution, manufacturing, and development of several VerifEYE food safety products and applications.

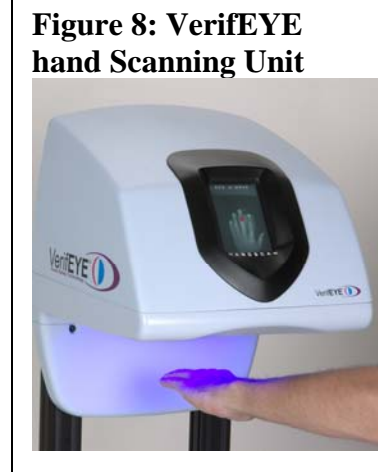
“eMerge's VerifEYE technology is a leading-edge food safety solution for the meat processors and grocery retailers,” said William P. Donnelly, Group Vice President. “We will combine the VerifEYE product with our other contaminant detection products. The VerifEYE technology will help further Mettler-Toledo's strategic position as the absolute leader in contamination detection, where safety is critical to our customer. We believe this technology can make a significant step forward in their food safety programs. In short, we expect great things from our relationship with eMerge.”

“This alliance will provide eMerge with widely expanded access to multiple markets for VerifEYE products, by leveraging Safeline's broad and technically-experienced sales team,” said David C Warren, CEO of eMerge. “Moreover, Safeline's unparalleled track record in providing industrial metal detection solutions provides a natural fit for the VerifEYE technology, setting the stage for both companies and ultimately Safeline customers to benefit from the relationship. The Memorandum allows the flexibility for Safeline and eMerge to work together on several key

initiatives that will be sure to further strengthen our alliance in the future.” (Smith, 2004).

Additional Uses of eMerge’s Technology

New VerifEYE-based hand-hygiene technology (Figure 8) may help to reduce food-borne illness outbreaks and spread of disease. Potential applications include over 550,000 locations for nursing homes, hospitals, day-care centers, restaurants, and other food-service facilities in the U.S.



Improper hand hygiene has been identified as the primary source of contamination in many disease outbreaks within the foodservice and cruise line industries, as well as a critical source of nosocomial infections (an infection acquired while in a health care setting, such as a hospital) within healthcare industries. A report published in the "Centers for Disease Control Emerging Infectious Diseases" (March 2002) indicated that the largest hospital-wide survey ever conducted found that proper hand hygiene prevents cross-contamination in hospitals, but healthcare workers' adherence to posted guidelines is poor. The study found that the average compliance with hand hygiene programs among different sections of hospitals, including open ward, emergency room, intensive care and others, was only 48 percent (Pittet, 2001).

Additionally, statistics from the FDA and National Restaurant Association indicate that food-borne illnesses kill over 5,000 people each year. An estimated 70% of outbreaks originate within foodservice businesses and up to 40% of outbreaks implicate poor hand washing and cross-contamination as the mode of transmission (USDA Economic Research Service, 2001). The VerifEYE Hand-Hygiene System will identify contaminants on the source that the U.S.

Centers for Disease Control deems responsible for up to 23% of the estimated 76 million cases of foodborne illness each year -- contaminated hands.

The VerifEYE-based hand-scanning system is designed for use as a wall-mounted device for optical inspection of human hands, further ensuring proper hand hygiene. The VerifEYE technology uses fluorescence to detect organic contaminants such as microscopic traces of fecal (organic) material, known to be responsible for the transmission of pathogens such as Shigella, Norovirus, Hepatitis-A and others. Users of the system will scan their hands after washing to detect the presence or absence of these organic contaminants. The system will then display the exact location of the contamination on an integrated LCD screen, instructing the user to further cleanse the area.

The scanning device is expected to be integrated into hand-hygiene programs at foodservice, childcare and healthcare facilities and will record performance data to help companies further improve employee compliance with their hand washing programs.

eMerge CEO, Dave Warren commented on this new technology.

"We are very excited about the development of this new product because it represents a significant opportunity to positively impact food safety and infection control across several new markets for eMerge. Initial market research has indicated high interest in the new hand-scanning system for use in the food service, healthcare, childcare, education and nursing home industries; where employee hygiene is a constant challenge and fecal-to-oral transmission of disease is identified as a primary source of many illnesses. There are over 550,000 such facilities in the U.S. alone, presenting a considerable market opportunity and allowing us to expand our applications beyond the beef production industry." (eMerge Interactive News Release, 2004)

Situation Analysis

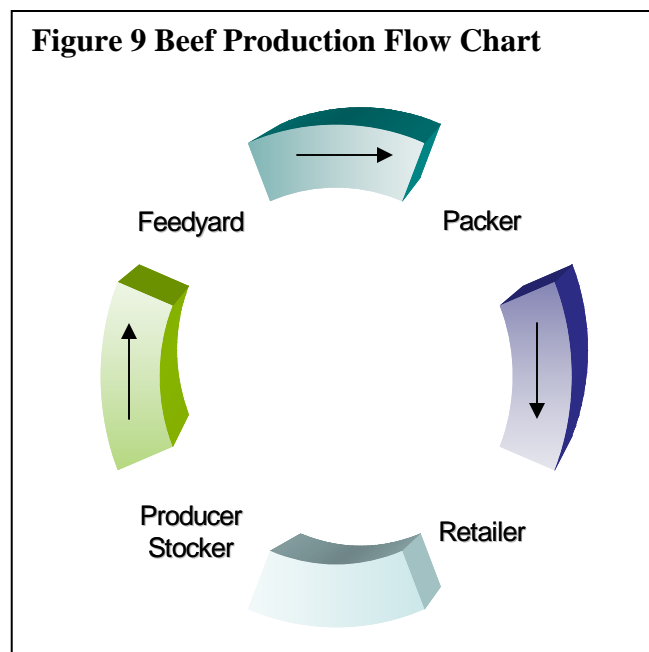
Having returned an operating loss every year since formation, eMerge is in a difficult position. They have had to constantly seek infusion of capital from venture capitalists and

investors to keep afloat in the dynamic industry of livestock technology solutions. Their focus has changed over the years from livestock marketing and e-commerce, to their current situation – an innovative technology company. Because of their inability to make profits, dividends have never been paid and eMerge staff has been greatly reduced, to a bare bones survival state.

Their VerifEYE technology has been a recent success. It is gaining popularity and keeping eMerge alive. The CattleLog data system has been gaining acceptance somewhat more slowly, but made significant progress in 2004. They have benefited greatly from recent partnerships with firms such as Archer Daniels Midland. The market is becoming more favorable with traceability and food safety requirements being established by the government, as well as a push for branded meat products. The international market is also moving in the direction of traced and labeled products.

The CattleLog System uses products from other firms to collect the data from the livestock. Thus, eMerge is offering the technology, but not necessarily all the tools. They are saving in the R & D and production costs of developing these while being able to specialize in other areas. CattleLog systems, however, are offered in bundled systems which provide this degree of convenience for the customer.

The livestock production industry may be considered a highly fragmented industry. Industry fragmentation can be viewed as the level of firm integration, both horizontally and vertically, within a



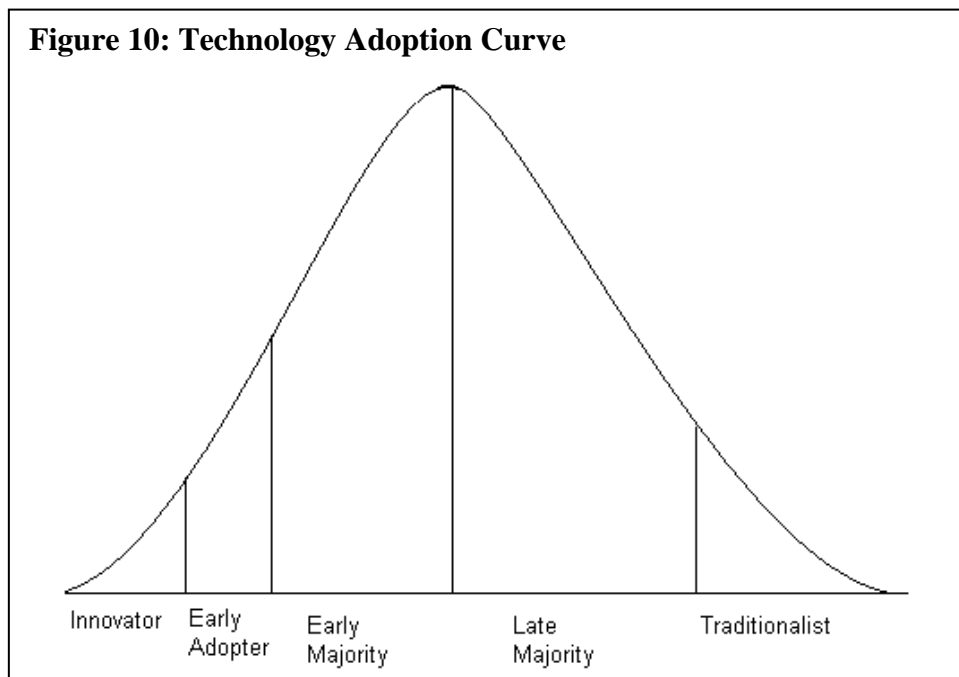
particular industry sector (United States Congress, Office of Technology Assessment, 1986). As shown in Figure 9, there are many processes that an animal goes through in the production process, each stage having a varying level of integration.

There are a very large number of livestock producers, all producing a relatively small number of cattle. There is very minimal integration in this industry sector. However, there are a number of producer organizations that help facilitate communication between producers as well as provide education and training. The feedyard sector is slightly more concentrated, but not nearly as concentrated as the packer/processing sector. There are five major players in beef processing, Tyson, Cargill, Swift, Smithfield, and National. Recently, some vertical integration has taken place in the industry, but as a whole the beef industry is not very integrated vertically or horizontally. Studies have shown that the degree of industry fragmentation can greatly affect the rate at which new technology is adopted into by that industry – the more fragmented, the slower the adoption. This may be a consideration when evaluating eMerge's market.

Although there seems to be a light at the end of the tunnel, surviving until then could prove to be a challenge. There are a number of paths that could currently be taken. The CattleLog system seems to have a bright future and a lot of resources have been put into its development, but it has not been profitable to this point. The VerifEYE technology has generated the most revenue and is the only technology of its type. However, the research and development costs associated with VerifEYE are very high and there is a small pool of target customers. VerifEYE is currently only used for beef, but could be expanded for use on other livestock such as chicken or pork. The Hand-Scanning Hygiene System looks very promising also.

The products seem to perfectly fit what the market needs, but acceptance has still been

slow. Looking at a Product Adoption Curve (Figure 10) may shed some light on the situation. Technological products are normally first adopted by “innovators”, people who like technology for its own sake. Those who have the vision to adapt an emerging technology to an opportunity that is important to them are the next to adopt. These are the groups who are currently using eMerge’s technology. Unfortunately, the livestock industry as a whole seems to be more towards the late majority or traditionalist end of the scale. Traditionalists tend to be suspicious of change and adopt it only after it has become somewhat of a tradition itself (Kotler and Armstrong, 1989). Market adoption seems to be eMerge’s greatest concern and it seems rightly so since this cutting edge technology is most appealing to early adopters and innovators when their market consists of traditionalists.



How is this gap bridged and how does eMerge stay alive long enough to move from one end of the curve to the other? What should be the short-run and long-run direction of eMerge and what business strategy will allow them to get there?

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APPENDIX A

Income Statement	For the year ended December 31st				
	2003	2002	2001	2000	1999
Net Sales or Revenues	0.93	13.16	1,195.30	803.02	43.78
Cost of Goods Sold	0.3	12.56	1,181.43	793.82	41.75
Depreciation, Depletion & Amortization	2.46	3.85	15.71	10.1	1.77
Gross Income	-1.83	-3.26	-1.83	-0.89	0.27
Selling, General & Admin Expenses	7.62	10.7	32.02	33.35	15.58
Other Operating Expenses	0	0.02	0	0	0
Other Expenses - Total	10.38	27.14	1,229.16	837.26	59.1
Operating Income	-9.45	-13.98	-33.85	-34.24	-15.32
Extraordinary Credit - Pretax	0	0	0	0	0
Extraordinary Charge - Pretax	0.42	6.38	57.41	3.79	0
Non-Operating Interest Income	0.05	1.75	0.62	5.01	0.48
Reserves - Inc(Dec)	0	0	0	0	0
Pretax Equity in Earnings	0	0	0	0	0
Other Income/Expenses - Net	0.03	-0.04	-0.41	0	0
Earnings Before Interest and Taxes	-9.8	-18.64	-91.06	-33.02	-14.84
Interest Expense On Debt	0.02	0.44	0.7	0.12	0.76
Interest Capitalized	0	0	0	0	0
Pretax Income	-9.82	-19.09	-91.75	-33.14	-15.61
Income Taxes	0	0	0	0	0
Current Domestic Income Taxes	0	0	0	0	0
Current Foreign Income Taxes	0	0	0	0	0
Deferred Domestic Income Taxes	0	0	0	0	0
Deferred Foreign Income Taxes	0	0	0	0	0
Income Tax Credits	0	0	0	0	0
Minority Interest	0	0	0.14	0	0
Equity in Earnings	0	0	-0.29	-0.08	0
After Tax Income/Expense	0	0	0	0	0
Discontinued Operations	0.09	0	0	0.08	0.01
Net Income Before Extra					
Items/Preferred Div	-9.73	-19.08	-92.19	-33.14	-15.6
Extra Items & Gain(Loss) Sale of Assets	0	-11.49	-0.23	0	0
Net Income Before Preferred Dividends	-9.73	-30.57	-92.42	-33.14	-15.6
Preferred Dividend Requirements	0	0	0	0	5.54
Net Income Available to Common	-9.73	-19.08	-92.19	-33.14	-21.13

in millions of USD

APPENDIX B

Annual Balance Sheet	For the year ended December 31st				
	2003	2002	2001	2000	1999
Cash and ST Investments	1.55	5.28	18.74	42.81	107.68
Receivables (Net)	0.29	2.7	12.9	15.62	1.14
Total Inventories	0.57	0.04	6.87	3.7	1.2
Raw Materials	0.5	0	0	0.12	0.66
Work in Progress	0	0	0	0	0.14
Finished Goods	0.07	0	0	0	0.4
Progress Payments & Other	0	0	0	3.58	0
Prepaid Expenses	0	0.19	2.19	1.07	0.07
Other Current Assets	0.64	0.3	2.27	2.88	0.91
Current Assets - Total	3.05	8.49	42.96	66.09	111
Long-Term Receivables	0	0.22	0	0	20.82
Investment in Unconsol Subsidiaries	0	0	2.72	3.01	0
Other Investments	0	0	0	0	1.82
Property, Plant & Equipment - Net	4.03	5.35	15.21	20.57	1.9
Property, Plant & Equipment - Gross	12.79	11.95	21.07	23.48	2.82
Accumulated Depreciation	8.76	6.6	5.86	2.91	0.92
Other Assets	0.08	0	7.81	58.88	6.4
Deferred Charges	0	0	0	0	0.45
Tangible Other Assets	0	0	1.51	1.51	0
Intangible Other Assets	0	0	6.31	57.38	5.96
Total Assets	7.16	14.06	68.7	148.55	141.94
Accounts Payable	0.75	0.57	12.04	9.51	1.19
ST Debt & Current Portion of LT Debt	0.52	0.32	10.02	1.44	0.58
Accrued Payroll	0.26	0.47	1.34	0.85	0.97
Income Taxes Payable	0	0	0	0	0
Dividends Payable	0	0	0	0	0
Other Current Liabilities	0.66	0.39	1.63	6.59	13.09
Current Liabilities - Total	2.18	1.74	25.03	18.38	15.83
Long-Term Debt	0	0.2	0.54	0.09	0
Provision for Risks and Charges	0	0	0	0	0
Deferred Income	0	0	0	0	0
Deferred Taxes	0	0	0	0	0
Deferred Tax Liability in Untaxed Reserves	0	0	0	0	0
Other Liabilities	1.6	0	0	0	0
Total Liabilities	3.79	1.94	25.57	18.48	15.83
Non-Equity Reserves	0	0	0	0	0
Minority Interest	0	0	0.55	0	0
Preferred Stock	0	0	0	0	0
Common Equity	3.37	12.12	42.58	130.08	126.11
Common Stock	0.34	0.32	0.32	0.28	0.25
Capital Surplus	201.69	200.73	200.23	195.35	153.37
Revaluation Reserves	0	0	0	0	0
Other Appropriated Reserves	0	0	-0.04	-0.04	-0.06
Unappropriated (Free) Reserves	0	0	0	0	0
Retained Earnings	-198.23	-188.5	-157.93	-65.51	-27.45
Equity in Untaxed Reserves	0	0	0	0	0
ESOP Guarantees	0	0	0	0	0
Unrealized Foreign Exchange Gain(Loss)	0	0	0	0	0
Unrealized Gain(Loss) on Marketable Securities	0	0	0	0	0
Treasury Stock	0.43	0.43	0	0	0
Total Liabilities & Shareholders Equity	7.16	14.06	68.7	148.55	141.94
Common Shares Outstanding (th)	40,898.47	38,780.44	39,634.17	35,139.67	32,144.15
				in millions of USD	

APPENDIX C

eMerge Stock Activity

