



FUTURE
of **FISH**

Getting There from Here

A Guide for Companies
Implementing Seafood Supply-
Chain Traceability Technology*

*And a call to action for all stakeholders who want
to reduce illegal fishing, fraud, and overfishing

This report was prepared by **Future of Fish**

August 2014

Future of Fish is a nonprofit systems change incubator. We work with entrepreneurs, industry players, and investors to create business solutions to ocean challenges. Future of Fish is committed to an ongoing dialogue about how technology can help the seafood industry become more efficient, rigorous, and responsible.

contact@futureoffish.org | www.futureoffish.org

© Future of Fish 2014

Synopsis

Over the past decade, the call for seafood traceability has grown louder and more urgent amid rising concerns about mislabeling, illegal fishing, and diminishing stocks of some of the world's most commercially important fish. Recent reports have now sounded additional alarms on human trafficking and modern-day slavery within the seafood supply chain.¹ For seafood companies attempting to play by the rules, these systemic failures threaten market efficiencies, brand integrity, and profits.

The seafood traceability agenda to date has been driven largely by nonprofits, consumer advocacy groups, and government agencies focused on product recall, public health, and accurate labeling issues. Increasingly, retailers and other industry representatives are taking up the cause, having been influenced by consumer demand for product transparency and recognizing the need to mitigate risk. However, in the absence of regulation, pushing full-chain implementation of the data-capture and management systems required to support true end-to-end traceability has proved challenging.

This report aims to highlight the compelling market incentives of traceability, while raising awareness of the very real human and technological barriers that hamper broader adoption. Through interviews with key technology vendors, NGOs, government agencies, trade groups, and a sample of supply-chain players, Future of Fish assessed:

- Credible business wins offered by traceability technology systems in general
- Twelve specific seafood traceability vendor solutions and the key business benefits of each
- Key principles for a smooth transition to traceability adoption and implementation

- Barriers to traceability technology adoption, successful implementation, and whole-chain traceability

The challenge for companies in the value chain, as well as for nonprofit or government stakeholders, is that the barriers to whole-chain traceability cannot be solved by one solution or player. They must be resolved through collaboration—between vendors, across value chains, and among competitors. At the close of this report, we issue an invitation to relevant players to join us on a path to forge the relationships and strategies to overcome structural, cultural, and technological challenges to a world without mystery fish.

What Is Traceability?

Traceability involves tracking the movement and history of a product back to its point of origin, as well as forward through the transformations and transactions it undergoes before reaching the final consumer. Full traceability requires both an internal process and the supporting technology for capturing, receiving, and transmitting information between every step in the supply chain, creating an end-to-end information highway from dock to plate.

For seafood, that means data related to species, catch location, catch date, gear type, vessel name, certification, and any other required information is linked to the fish at the time of harvest. Once the fish is landed, the information must accompany that fish as it is transported, processed, distributed, bought, and sold. To ensure the data is valid, the system must be designed to prevent tampering or deliberate falsification of information.

Consumer demand for tracking the origin of food products is fueling growth of traceability technology. Allied Market Research predicts that the global market for food traceability technology (including but not exclusive to fish) will grow by 8.7 percent annually for the rest of the decade, reaching revenue of \$14.1 billion by 2020.²

Building a Business Case for Traceability

Efforts by nonprofits and government agencies to push their traceability agendas are often confounded by the fact that many companies perceive traceability technology as purely an added cost with no measurable returns. Where the benefits of traceability have been discussed, conversations tend to focus primarily on traceability as insurance—minimizing the costs of recalls or insulating companies from supply-chain scandals, recently experienced by the beef industry with horsemeat and “pink slime.” However, overlooked in the discussion—and largely ignored by seafood companies themselves—are the clear business wins offered by traceability technology.

Within the seafood industry, the ability of fishers, processors, distributors, and retailers to seamlessly share key information about a product as it wends its way from dock to dinner plate can improve inventory management, reduce operational inefficiencies, reduce waste and improve yields, increase the pace of decision making, and fuel innovation across the entire business ecosystem. For an industry where the difference between making a profit and being in the red can be a matter of pennies per pound, traceability technology can provide clear competitive advantage, especially for midchain players.

The following sections outline those benefits by drawing on examples from seafood supply chain players, traceability vendors, and technology experts interviewed for this report.

INVENTORY MANAGEMENT

Inventory management is a by-product of many traceability technology solutions, as the ability to manage yields in various stages of processing, in real time, and trace products' origins helps companies properly match quality, quantity, and pricing to maximize revenues and reduce oversold or unsold stock.

“Larger fisheries are beginning to understand that traceability can play a role in managing their assets,” says Mark Soboil, cofounder of BackTracker, a startup that has developed a traceability data repository for the seafood industry. “If you catch 10 tons of snapper, you can quickly go on our system to see how much it’s trading for, who else has it, who’s willing to buy, and you can do your transaction right then and there.”

Norpac Fisheries Export, a Honolulu-based seafood processing and distribution company, developed its own traceability platform where fish are tagged during unloading or at auction with a barcode containing the fish’s origin, catch date, and other pertinent data. If a Wi-Fi connection is available on-site, the data are transmitted directly to the Norpac database. Upon arrival at the processor, the fish’s barcode is scanned and the system automatically prints out a label with both the barcode and human-readable information. As the fish is partitioned into fillets, new barcodes are attached that link the partitioned product to the original whole-fish barcode. Integrating Norpac’s traceability platform with an accounting system provides deeper insights into everything from quarterly sales to the type of packaging used. “In terms of managing costs of goods sold, it has revolutionized what we’re able to do,” says Norpac founder Thomas Kraft.

OPERATIONAL EFFICIENCIES

Because traceability systems enable a clear audit trail for inventory, they can help companies improve internal operations and reduce costs by highlighting the processes and workflows that are most efficient—and those that are not. Improving efficiencies can also have a positive indirect impact on workforces.

“When employees are asked to put in a lot of overtime, mistakes can happen—mistakes that are costly to your business and to your employees,” says Norpac’s Kraft. “When you tighten it all up, all aspects of the business start to run better.

Once employees see how these systems can help them do their jobs better, you start to see a shift in perception, and you end up having happier, healthier employees.” The increased efficiencies captured through the system have helped Norpac reduce staff overtime from as many as 1,600 hours a month to fewer than 100.

The increased efficiencies captured through the system have helped Norpac reduce staff overtime from as many as 1,600 hours a month to fewer than 100.

Seafood processor-distributor Mayport C&C Fisheries has seen improvements in several aspects of its operations since implementing SeaTouch, an enterprise resource planning (ERP) solution developed by Ridium Technologies. For example, the company now uses touch-screen computers for order processing, eliminating paper-based cutting and pick tickets. New orders are transmitted automatically to the warehouse, freeing up salespeople to take other calls. “Our sales staff is now selling more than ever because they are more available to our customers,” says Mayport C&C Fisheries president Atillio Cerqueira. Total sales per order and profit per order have both increased since the company deployed SeaTouch, he adds.

BUSINESS INTELLIGENCE

Nearly every industry, from health care to financial services, has invested in data analytics and business intelligence capabilities to improve their understanding of customers, markets, and their own business performance. Those tools utilize algorithms to identify patterns within data and unlock insights to improve decision-making capabilities. For seafood

companies, the ability to collect and analyze traceability data, combined with other data that they have long collected from their operations, can drive better management decisions; it can help companies to be more proactive and predictive about their business practices and about the markets in which they compete. Traceability solutions are evolving to support more sophisticated analytics capabilities, and offer a variety of other analysis features and tools that give businesses better insight into their operations.

For example, ScoringAg offers a database that enables worldwide tracing, record keeping, and documentation of agricultural products and seafood with real-time, point-to-point traceability for each individual product. The database simplifies the record-keeping process through an interactive universal traceback methodology, and includes an algorithm that detects abnormal data patterns regarding vessel behavior such as dock location, date, and time of submission. Those types of analytics can be used to detect abnormal spending patterns, identify product relationships, and better predict retail demand.

Similarly ThisFish, a web-based traceability tool developed by Ecotrust Canada, collects catch, processing, and handling information from harvesters and processors and links it to a unique code attached to individual fish or fish lots. The code follows the fish all the way to the consumer. “The processors, buyers, and exporters tell us that the transparency and accountability has improved quality,” says Eric Enno Tamm, team leader for ThisFish. “The fact that the fish harvester knows that their face is going to be on their product increases the incentive for them to take greater care of it.”

MARKETING, CSR, AND BRAND LOYALTY

Traceability is fundamentally linked to the integrity of seafood labeling, including claims of sustainability, species name, catch location, and any other information that is of value to consumers. In some markets, demand for “storied fish”—seafood that comes with detailed and verifiable information about its journey from water to plate—is translating into price premiums. Several small-scale fisher organizations in the US that have implemented boat-to-plate traceability systems have realized 18 to 30 percent higher margins for storied fish.³

The ability to verify the accuracy of the information on a seafood label also supports corporate commitment to social responsibility—be it related to sustainability, local sourcing, or human rights. Traceability can help protect brand reputation, earn consumer trust, and build customer loyalty, as well. But grocers and restaurants are not the only players that stand to benefit. For example, embedding traceability information into a QR code gives early-chain players the ability to market directly to end customers with coupons, recipes, or other information that over time can build brand loyalty. “It’s a way to turn a very costly project—compliance—into a revenue-generating opportunity,” says Christian Hutter, executive vice president of strategy and products for Junction Solutions, an ERP system for the food and beverage industry.

Several consumer-facing web portals enable companies at the front end of the supply chain to enhance their brands by telling the journeys of the fish they catch, process, and distribute. For a full list of all traceability vendors interviewed and the product features currently available, see the Appendix.

Barriers to Traceability

Despite the benefits outlined, our research uncovered a complex of barriers impeding end-to-end seafood traceability, which must be addressed differentially with context-appropriate strategies and interventions. These barriers fall into two general categories: barriers to whole-chain traceability and barriers to adoption of traceability.

BARRIERS TO ADOPTION

Data security concerns

Privacy concerns drive many companies' resistance to participating in whole-chain traceability, as a data breach could result in the release of proprietary information, divulgence of business secrets, or the loss of competitive advantage. Such fears compel some small companies to continue with archaic paper-based systems for tracking and tracing. Others adopt internal tracking systems, but refuse to share anything beyond what the government requires.

Lack of compelling evidence of return on investment (ROI)

Implementing a traceability system can be expensive, and the tangible benefits vary by a company's position in the supply chain, as well as by the specifics of a company's current technology systems (or lack thereof). Currently, insufficient evidence that traceability has a positive return keeps some midchain businesses from adopting these systems. In fact, there is a widespread assumption that traceability systems may cost more than the benefits they can generate and, consequently, will drive up consumer prices.

A guarded culture

General lack of trust among trading partners and competitors in the supply chain continues to stall progress toward whole-chain traceability. Seafood is a highly competitive industry made up of many family-owned businesses that are wary of technologies posing a threat to their established, time-tested methods. Partnerships are based on trust built across generations, and there is reluctance to share data if there's any risk that it might fall into competitors' hands.

Archaic data-capture and management practices

Most data-collection practices are exceptionally outdated; it is not uncommon to see fishers and landing-dock workers using paper and pencil to record catches. Once the fish leaves the dock, manual data re-entry often continues at multiple levels, which further amplifies the risk of error and opens the door to fraud. Given the status quo, the adoption of traceability technology must be accompanied by human systems that properly implement that technology—the technology on its own is not a solution. A lack of appropriate training, insufficient education of modified business practices, incomplete updating of operating procedures, or uncoordinated collaboration both within a company and among trading partners will hamstring even the most effective technological tools.

Midchain black holes

Traceability data captured upon landing a catch is often decoupled from the fish upon reaching the processor. For some processors it's a matter of efficiency; they receive product from multiple sources simultaneously and it's easier to combine catches than to keep them separate. Other processors have found they can game the system by masking a fish's true identity and passing it off to their customers as something better. True traceability requires an unbroken chain of custody.

Moving beyond Mystery Fish

The movement toward sustainability in the seafood industry often overlooks a basic fact: most seafood is “mystery fish.” Where a fish was caught, how it was caught, and by whom is information absent not just from the label—it's often unknown or unverifiable by the market or restaurant selling it.

In 2013 Oceana released the results of their two-year investigation of US grocery stores, restaurants, and sushi bars, reporting that one-third of all 1,215 samples analyzed were mislabeled, and 44 percent of the 674 retail outlets visited sold mislabeled fish.^a Other studies, including one by *Consumer Reports* in 2011, have drawn a similar conclusion: inaccurate information about the species, origin, catch method, or other details of certain types of fish in North America is more the rule than the exception.^b

In addition to the billions of dollars represented by mislabeled seafood, an estimated \$10 billion to \$23.5 billion worth of black-market fish is smuggled into legitimate supply chains every year.^c In the US, recent research suggests that 20 to 32 percent of wild-seafood imports are illegal.^d

NOTES

- a. “Oceana Study Reveals Seafood Fraud Nationwide,” Oceana, Feb. 21, 2013, <http://oceana.org/en/news-media/publications/reports/oceana-study-reveals-seafood-fraud-nationwide>.
- b. “Mystery Fish: The Label Said Red Snapper, the Lab Said Baloney,” *Consumer Reports*, December 2011, <http://www.consumerreports.org/cro/magazine-archive/2011/december/food/fake-fish/overview/index.htm>.
- c. “Illegal Fishing: Not in Our Ports,” NOAA (National Oceanic and Atmospheric Administration) Fisheries Service, accessed May 2, 2014, http://www.nmfs.noaa.gov/ia/iuu/portstate_factsheet.pdf.
- d. G. Pramod, et al., “Estimates of Illegal and Unreported Fish in Seafood Imports to the USA,” *Marine Policy*, 48 (September 2014): 102–113, <http://www.sciencedirect.com/science/article/pii/S0308597X14000918>.

BARRIERS TO WHOLE-CHAIN TRACEABILITY

Information silos

The information that fishers, processors, distributors, and retailers collect as seafood products pass through the supply chain is often kept in silos, closely guarded by their respective owners and walled off from partners and customers. That practice hinders, if not prohibits, the sharing and verifying of data across the full chain of custody. The lack of data sharing is also evident at a meta-level: Many supply chains are conducting traceability pilot studies, but there is no process for feeding the results of those studies to broader industry audiences, nor are lessons being synthesized in order to scale to the level of industry standards or best practices.

“The challenge is not lack of data,” says Andy Furner, VP of marketing and business development at Trace Register. “There is a huge amount of data. The challenge is that the data is functionally stranded in the internal systems of each company in the supply chain. What businesses need is a way of easily getting to that information and sharing it.”

Lack of universal standards

Non-uniform methodology for data capture, storage, and sharing; differences in terminology used by different players along the chain; and differences in the types of data captured and transmitted by different players along the chain result in communications failures among supply-chain participants. Lack of standardization and capture of universal product identifiers also impedes the interoperability of traceability systems that might otherwise be compatible.

An Overview of Standards

An industry-wide adoption of standards for capturing and verifying trace data would go a long way toward making traceability prevalent in the seafood industry—and it doesn’t depend on policy to implement; it just takes industry buy-in.

Seafood certification programs have the backing of the world’s largest standards-setting body, the International Organization for Standardization (ISO). In 2007, the ISO created a committee to develop technical standards for fisheries and aquaculture. Twenty-seven countries participate in the ISO TC234 certification committee, with another 19 “observing countries.” Three standards have been published to date, two of which specify data-capture requirements to verify traceability across supply chains for captured and farm-raised finfish.^a

Another certification standard was established by the UK’s Marine Stewardship Council (MSC) in December 1999. Their Chain of Custody (CoC) standard allows an MSC ecolabel to be displayed on seafood from fisheries that meet the MSC environmental standard for sustainable fishing.^b Version 3 of the standard was published in 2011.^c A related project launched in 2007 focuses on traceability, with an emphasis on accessibility for smaller, independent businesses, improving the quality and consistency of assessments, verification systems such as DNA testing, random checks by certifiers, and a system for double-checking claims.

In 2014, MSC began a formal review of the CoC program to evaluate standard and certification requirements and examine ways to further improve the program’s accessibility and consistency.^d

GS1, an international nonprofit organization, released its Global Traceability Standard (GTS) in 2007, which defines globally accepted methods for uniquely identifying trading partners, trading locations, products, and logistics of inbound and outbound shipments.^e The standard also defines the essential information that must be collected, recorded, and shared to ensure “one step up, one step down” traceability for all types of food and other products, such as cosmetics.

Seafood players might look to the organic food industry as a model for successful certification programs. The USDA's Organic Foods Production Act (OFPA), enacted as part of the 1990 Farm Bill, established national standards for the production and handling of foods labeled "organic." Producers who meet standards set by the USDA's National Organic Program may label their products "USDA Certified Organic."

In most other countries, all supply-chain partners that handle produce—the companies that produce the organic agricultural ingredients, the handlers of those agricultural ingredients, and the manufacturer of the final product—must all be reviewed by an accredited organic certifying agent before a product is certified organic.^f

The standards have helped to create a booming market for organic-labeled foods. The industry grew 170 percent globally from 2002 to 2011, reaching \$63 billion in sales in 2011.^g

NOTES

- a. "ISO/TC 234—Fisheries and Aquaculture," International Organization for Standardization (ISO), accessed May 6, 2014, http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=541071&published=on&includesc=true; "ISO 12875:2011 Traceability of Finfish Products—Specification on the Information to Be Recorded in Captured Finfish Distribution Chains," ISO, accessed May 6, 2014, http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=52084&commid=541071; "ISO 12877:2011 Traceability of Finfish Products—Specification on the Information to Be Recorded in Farmed Finfish Distribution Chains," accessed May 6, 2014, http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=52085&commid=541071.
- b. "MSC Chain of Custody Standard for Seafood Traceability," Marine Stewardship Council (MSC), accessed May 6, 2014, <http://www.msc.org/about-us/standards/standards/chain-of-custody>; "MSC Environmental Standard for Sustainable Fishing," MSC, accessed May 6, 2014, <http://www.msc.org/about-us/standards/standards/msc-environmental-standard>.
- c. "MSC Chain of Custody Standard," MSC, August 2011, <http://www.msc.org/documents/scheme-documents/msc-standards/msc-coc-standard-v3>.
- d. "Chain of Custody Program Review," MSC, accessed May 6, 2014, <http://www.msc.org/about-us/consultations/chain-of-custody-program-review>.
- e. "GS1 Standards Document GS1 Global Traceability," GS1, November 2012, http://www.gs1.org/sites/default/files/docs/gsmpt/traceability/Global_Traceability_Standard.pdf.
- f. "Organic Certification," National Sanitation Foundation (NSF), accessed May 6, 2014, <http://www.nsf.org/consumer-resources/what-is-nsf-certification/organic-certification/>.
- g. "Organic Food Is \$63 Billion Global Industry," SustainableBusiness.com News, May 16, 2013, <https://www.sustainablebusiness.com/index.cfm/go/news.display/id/24886>.

Lack of interoperability

Many traceability-related components are already in place within the seafood industry as part of other enterprise resource management (ERM) systems. However, this piecemeal approach to traceability—where members of the supply chain use different technology-solution providers (including many homegrown legacy platforms)—often inhibits

data sharing and interoperability. Limited IT budgets and expertise preclude development of middleware designed to tie together disparate systems, let alone a leading-edge mobile or other application to facilitate data capture, sharing, and analysis. "Many technologies claim they can provide whole-chain visibility," says Tejas Bhatt, program

director at the Institute of Food Technologists (IFT). “From a practical standpoint, that’s just not feasible. Forward-thinking technology vendors understand that they’ll be part of a whole, not the whole.”

Industry fragmentation

Finding a single traceability solution that works well for everyone is virtually impossible, given the global nature of the seafood industry, the variety of players in the supply chain, the large number of fish species, the proliferation of customized ERP systems, and the scale of businesses running the gamut from single-vessel fishers to multinational and vertically integrated processors or distributors.

Policy paralysis

Even companies that are ready to invest in traceability systems may be reluctant to do so, pending anticipated regulations. Some supply-chain players are choosing not to move forward out of fear they’ll move in the wrong direction. Others refuse to assume costs that their competitors aren’t also taking on. The inaction on the part of government agencies tasked with regulating food systems is hampering the maturation of technologies and standards necessary for achieving whole-chain traceability.

The State of Traceability Policy

Government bodies have introduced or passed a variety of legislation designed to improve labeling and other disclosure practices for seafood and other food types.

- **Food Information Regulation (FIR):** Adopted by the European Union in September 2011, the Food Information for Consumers Regulations were designed to simplify and consolidate existing labeling legislation across all EU members. Most requirements are slated to take effect in 2014; nutrition labeling will become mandatory in 2016.^a
- **HACCP Regulation for Fish and Fishery Products:** Passed in 1997, this US regulation requires processors of fish and fishery products to develop and implement hazard analysis critical control point (HACCP) systems for their operations.^b
- **Safety and Fraud Enforcement for Seafood Act:** Still in congressional committee, US Senate Bill S.520 (also H.R. 1012) is designed to strengthen federal consumer protection and product traceability with respect to commercially marketed seafood. A similar bill to mandate full traceability for all seafood sold in the US was introduced in the House of Representatives in July 2012, but died in committee.^c
- **Country of Origin Labeling (COOL) law:** The 2009 US law, enforced by the Department of Agriculture, requires that seafood entering the US be accompanied by a label indicating which country it came from and whether it was farm raised or wild caught.^d
- **Bioterrorism Act of 2002:** Signed into law in June 2002, this act contains a section on food supply that gives federal agencies authority to “establish requirements to identify the immediate previous sources and the immediate subsequent recipients of food, including its packaging.”^e
- **Food Safety Modernization Act (FSMA):** The US Food and Drug Administration’s FSMA, signed into law in January 2011, shifts the focus of food safety to preventing contamination rather than simply responding to it after the fact. The law deals with imported and domestically raised foods of all types, including seafood. Implementation is ongoing and includes pilot projects for product tracing.^f

- Presidential Memorandum—Comprehensive Framework to Combat Illegal, Unreported, and Unregulated Fishing and Seafood Fraud: By order of President Barack Obama in June 2014, a task force consisting of representatives of federal agencies and cochaired by the Secretaries of State and Commerce will convene to develop a national strategy for enhancing seafood traceability and transparency.⁸

NOTES

- a. “Providing Food Information for Consumers,” Food Standards Agency, accessed May 2, 2014, <http://www.food.gov.uk/enforcement/regulation/fir/labellingproposals/#.U0W7JqhdVSs>; “Food Information Regulation,” Food Standards Agency, accessed May 2, 2014, <http://food.gov.uk/enforcement/regulation/fir/#.U1yJl4xOUdU>.
- b. “Guidance for Industry: HACCP Regulation for Fish and Fishery Products; Questions and Answers for Guidance to Facilitate the Implementation of a HACCP System in Seafood Processing,” US Food and Drug Administration (FDA), issue 3 (1999), last updated July 5, 2013, <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm176892.htm>.
- c. Safety and Fraud Enforcement for Seafood Act, <https://www.govtrack.us/congress/bills/113/s520>.
- d. “Country of Origin Labeling,” USDA Agricultural Marketing Service, last updated September 23, 2013, <http://www.ams.usda.gov/AMSv1.0/amsLabeling&rightNav1=CountryofOriginLabeling&topNav=&leftNav=CommodityAreas&page=CountryOfOriginLabeling&acct=cntryoforgnbl>; Gretchen Goetz, “Looking Upstream: Seafood Traceability in a Global Economy,” Food Safety News, May 30, 2013, <http://www.foodsafetynews.com/2013/05/looking-upstream-seafood-traceability-in-a-global-economy/#.U1yXJYxOUdU>.
- e. “Bioterrorism Act of 2002,” FDA, last updated June 18, 2009, <http://www.fda.gov/RegulatoryInformation/Legislation/ucm148797.htm>.
- f. “FDA Food Safety Modernization Act (FSMA),” FDA, last updated May 2, 2014, <http://www.fda.gov/food/guidanceregulation/fsma/default.htm>; “FSMA Progress Reports,” FDA, last updated May 2, 2014, <http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm255893.htm>; “FDA Seeks Comments on IFT Report on Product Tracing Pilots,” FDA, March 4, 2013, <http://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm342068.htm>.
- g. “Presidential Memorandum – Comprehensive Framework to Combat Illegal, Unreported, and Unregulated Fishing and Seafood Fraud,” The White House, accessed July 17, 2014, <http://www.whitehouse.gov/the-press-office/2014/06/17/presidential-memorandum-comprehensive-framework-combat-illegal-unreported>.

A Smooth Transition to Traceability Adoption

While a company interested in adopting a traceability system will need to perform its own due diligence, we have identified the following basic principles that can help smooth implementation and foster acceptance and use across the organization and with key partners in the supply chain. However, as noted, every traceability platform is different, and the needs seafood businesses vary widely. Companies will also need to consider what solutions their suppliers and customers are using. “It’s important to map supplier capabilities with customer requirements,” says IFT’s Tejas Bhatt. “You don’t all have to pick the same solution, but by understanding each other’s requirements, you can come up with a system that meets everyone’s needs.” In other words, collaboration is key. In many cases, following these four principles will serve to surmount many of the aforementioned barriers.

What to Look for in Traceability Technology

In 2013, the Institute of Food Technologists launched the Global Food Traceability Center to provide research and expertise about food-product traceability. Part of the center's mission is to accelerate the adoption and implementation of practical traceability solutions across the global supply chain. Tejas Bhatt, IFT program director, offers his suggestions on what to look for when evaluating traceability technology.

Checklist features:

- The ability to retain control of one's own key data elements (KDEs)
- The ability to grant others (suppliers, customers, regulators) conditional access rights to one's own KDEs
- Business intelligence or analytics that help enhance one's own business (as opposed to an entire supply chain or industry's market). Assuming that everyone in the industry must subscribe to a single technology is not a practical approach. The sum of individual improvements will ultimately be greater than its parts.
- Analytical mechanisms to make sense of the large datasets that traceability can generate—e.g., sorting, searching, filtering, visualizing, aggregating, de-aggregating, flagging (for error-prone data)
- Interoperability with other third-party technology solutions (with appropriate access-control rights)
- Mass balancing and yield calculations to improve operational efficiencies and guard against seafood fraud

“Nice to have” features:

- *QR codes*: There is very little scientific research to suggest that consumers prefer to scan QR codes to see the image of the fisherman that caught their fish. At this point, it's more of a marketing effort than a real market driver. However, having this ability realizes other operational efficiencies.
- *Item-level traceability*: In general, the volume of fish that moves through the seafood value chain is too large and cost prohibitive to justify tracking individual fish from source to plate. A lot-based approach is more pragmatic.
- *Integration with food safety features (such as time/temperature control and monitoring)*: This additional layer of integration can provide some incremental benefits, but it may also be unnecessarily expensive.

Be skeptical of:

- *Inventory management software as a proxy for traceability*. An important aspect of traceability is recognizing that an individual facility is a critical link in a much larger supply chain. If all the food coming into a facility is not accurately linked to all the food leaving that facility, your inventory-management software is working but your traceability capabilities are not. At the end of the day, whole-chain traceability is made up of multiple internal (within the four walls of a facility) and external (between two facilities) traceability systems.
- *Map-based visualizations*. Because any complex food product and its supply chain are so complicated, displaying several thousand lines on a map-based interface is an ineffective way to analyze traceability data. It may look good in a demo when the supply chains have been simplified, but without adequate filtering technology, a map-based user interface is impractical in the real world.

- *Continuous sharing of business transactional data.* Companies should be required to share transactional data with other stakeholders only when needed and appropriate at certain critical tracking events (CTEs)
- *Global databases:* In order for a single technology provider to maintain a global database of the entire seafood industry, the underlying assumption is that everyone in the industry must subscribe to that one technology. That is not a feasible approach.
- *Proprietary identifiers:* This is a slippery slope because it can lock customers into a specific technology. In the long run, an open-source standard for naming and identification is much more practical than proprietary methods.
- *FSMA compliance:* Solution providers that claim to be FSMA-compliant are using that term purely for marketing purposes. The rules and regulations around FSMA have not been published as of this report's release, and there is no possible way for a solution to be compliant with specifications that have not been finalized.
- *Claims of whole-chain traceability:* Vendors that claim to enable full supply-chain traceability across all stakeholders make an important assumption: that the internal traceability of individual stakeholders is working perfectly and can link all incoming shipments to outgoing shipments at each facility. That's a rare occurrence in the real world.

NOTE

- a. Rosetta Newsome, Tejas Bhatt, and Jennifer McEntire. "Proceedings of the July 2011 Traceability Research Summit" *Journal of Food Science*, 2013, 78.

BUILD TRACEABILITY INTO THE BUSINESS PLAN

Food safety regulations and consumer demand for increased product transparency were the early impetus behind traceability systems. But in order to justify the costs associated with a traceability system investment, seafood companies need to take a more holistic view that encompasses the economic benefits of traceability. In other words, leadership teams should look at traceability as they would any other strategic investment toward growing the business.

Investments in traceability systems can be evaluated as part of an overall corporate risk management strategy, considering not only the benefits of improved recall response, but also the contribution of traceability systems to brand protection through improved quality control and business continuity capabilities.

Other cost-benefit calculations can be challenging because traceability systems are often components of other systems and span numerous business processes. Businesses can extrapolate ROI benefits from other food sectors; for example, a study of traceability in the dairy processing industry by Agriculture and Agri-Food Canada found that 60 percent of respondents felt the benefits of implementing a traceability system exceeded the costs, while just 4.5 percent says the costs incurred exceeded the benefits.⁴ The Institute of Food Technologists' Global Food Traceability Center is developing a tool to help seafood companies project the ROI from traceability technology implementation, which is due for release in fall 2014.

IMPLEMENT PROTOCOLS AND PROCESSES TO MAXIMIZE SUCCESS

Technology vendors understand the importance of mapping their traceability systems to existing processes and policies. However, seafood companies also should take advantage of the opportunities that come with a technology deployment to tighten up inefficient workflows and refresh outdated data. As with any technology upgrade, a prerequisite to deploying a traceability system involves identifying the best policies and processes for inputting, managing, and exchanging data. A traceability system is only as good as the quality of the information that's entered into it; it won't fix broken processes or inaccurate data.

Seafood suppliers should consider establishing case-level product protocols that can be shared across suppliers, retailers, wholesalers, and distributors. At minimum, suppliers should assign a batch/lot number for case-level traceability.⁵ “For absolute traceability, lot control must be employed,” says Lew McCabe, Ridium Technology's founder and president.

Companies should also explore adopting data-capture standards such as electronic data interchange (EDI) to make information shareable throughout the supply chain, along with other standards for labeling and chain-of-custody procedures. The push to deploy more identifier codes, barcodes, and RFID devices will increase the pace and volume of data being collected. Failing to address data-management issues before deploying those technologies will create costly complications and undermine supply-chain collaboration.

ENHANCE THE DATA VERIFICATION PROCESS

Verification is a critical element of traceability because it's the only true way to ensure that the information traveling with seafood products across the supply chain is accurate. Data must be verified and validated across its entire journey, not just when the fish is caught.

“At every gate, from transport to facilities to production to shopping, you have to have high levels of confidence that the data is right,” says Junction Solutions' Hutter. “So the focus should be on verifying the data, not re-creating it.”

While it may be impossible to create fully airtight verification, companies can take steps to improve their verification processes and ensure that all partners and customers are following accepted best practices for traceability. Companies should enable and support a variety of verification processes, combining traditional methods with emerging technology solutions to connect the dots across the supply chain and ensure that the perception of a product's history matches the reality. These methods include:

- paper audits
- on-site inspections
- company declarations/affidavits
- customer audits
- third-party audits
- health and safety certifications
- sustainability certifications
- mock recalls
- DNA testing

Verification requires more than just assigning a barcode to each fish. Trace Register's Data Check module, for example, analyzes incoming data against three criteria to ensure that it is trustworthy:

- **Completeness:** Is all required information (e.g., catch species, location, gear type, season, etc.) provided?
- **Consistency:** Do key attributes remain consistent through the supply chain? For example, the species name at the retailer should be the same as it was at the harvester.
- **Validity:** Does source product, catch method, location, etc., comply with sustainability policies? Is a producer in good standing with a certifier? Is a fishing vessel found on any IUU (illegal, unreported and unregulated) lists?

“If you don't trust the data, you won't use it,” says Phil Werdal, CEO of Trace Register. “And if you don't use it, it has no value.”

BUILD TRUST, SHARE DATA

Protecting proprietary data from competitors will always be a concern—as it should be. But the need to share key product information to uphold food safety, maintain regulatory compliance, and improve operational efficiency requires that companies explore new ways to safely and securely share data across the supply chain. Traceability won't work if companies are unwilling to collaborate.

The vendors we interviewed emphasize that security is paramount in their products and services. Most use high-level encryption to secure information when it's stored in the database and as it moves between partners. Similarly, cloud-based platforms use encryption techniques to ensure that only authorized users can access information, and that they view only the information they are authorized to see.

IFT's Bhatt sees a future in which each company continues to secure its own data internally, exposing only relevant information via protocols that are triggered by a customer query or the next step in a predefined workflow. The technology of today makes it possible to protect and share data through trusted systems.

Traceability won't work if companies are unwilling to collaborate.

The Role of Cloud-Based Data Management

The rapid growth of cloud computing—the concept of storing and accessing applications and data over the Internet instead of on in-house servers—is providing seafood companies with a secure, cost-effective mechanism for traceability. Specifically, cloud platforms and “software as a service” delivery models are leveling the playing field for smaller organizations because they don't require large capital investments in hardware or packaged applications.

Routing trace data through third-party data clearinghouses or other cloud-based platforms also should mitigate a major concern of many seafood companies: protecting their intellectual property. A “hybrid” cloud model, in which companies keep their most sensitive data on-site while sharing traceability data through the cloud, could convince more supply-chain players to join the traceability movement.

“It's not about divulging your business secrets—it's about letting your customers see that what you're delivering to them has integrity,” says Alan Steele, CEO and president of Traceall Global Ltd. Traceall's Supplier Exchange is a web-based portal that allows companies to create a complete, secure audit trail of the products they're purchasing.

Backtracker, a New Zealand-based startup, has developed a web-based platform that acts as an independent data bank, collecting data from seafood companies and providing secure, permission-based access by approved partners. Backtracker provides the software layer to interface with a customer's in-house databases—in effect, connecting the dots to provide full chain-of-custody auditing, says Mark Soboil, a BackTracker cofounder.

At ScoringAg, data entered into its web portal is encrypted and shareable in real time via a unique ID. Once records are entered in the system, they can't be modified, providing an additional layer of security, says William Kanitz, ScoringAg's president.

Closing Thoughts: Transforming the Status Quo

Seafood traceability technology is a relatively new and evolving market. As the market matures and gains definition, vendors will need to form strategic partnerships and work with customers and other vendors to integrate their solutions with complementary applications and systems. The technology experts we spoke with were confident that such technological fixes were within reach, if not already deployed in other industries.

But technology solves only half of the data-protection problem. The other half lies in the mindsets of the business leaders who are wary of sharing competitive information, who are resistant to new technology or management models, or who feel more comfortable preserving the status quo. By maintaining the old ways of doing business, the industry is missing out on an opportunity to build value at a time when costs continue to rise.

Changing mindsets must begin at the top of each organization, with leaders embracing the role of innovation catalysts. They must be willing to work with people on all sides of the policy debate to drive change, acknowledging everyone's self-interests while pursuing a common goal. They must support experiments in end-to-end traceability, trumpeting the successes and learning from the failures. Only then will mindsets and behaviors begin to evolve in a way that will drive true end-to-end traceability.

INSIGHTS FOR DEVELOPMENT

Multiple interviews with diverse stakeholders (technology vendors, NGOs, academics, and industry players) offered the opportunity to distill system-level

insights regarding the nature of the traceability problem and potential pathways for moving forward, including:

- A singular database of traceability information is not practical: According to industry players, a singular database that holds all product traceability data is both unrealistic and undesirable.
- Standardization and interoperability are key: Once data collection practices are harmonized at each point in the supply chain, privacy measures are put into place, and systems are interoperable, then, according to IFT's Bhatt, "any number of technological approaches can be adopted by various sectors within the supply chain and result in an effective tracing system".
- Give companies autonomy: Companies want to be able to choose their own traceability technologies and to decide for themselves how they implement new traceability systems and practices. They do not want to be forced to use a particular platform.
- A seamless solution will be most successful: Interoperability frameworks that link existing technologies must involve minimal IT changes, and be capable of importing data via a variety of methods and in a variety of formats.

NEXT STEPS

To facilitate the evolution of both the technology and cultural pieces of the traceability puzzle, Future of Fish aims to bring together key players with diverse expertise to collaboratively design solutions that address the technology, cultural, and systems-level barriers captured here. These design workshops will use a co-design process to build upon the insights gained from this report and the growing body of knowledge on traceability systems, and most importantly, will draw from the unique experience of participants in the room to generate realistic and innovative solutions to this complex system challenge. For more information, email us at contact@futureoffish.org.

NOTES

1. Steve Trent, "Slavery in Supermarket Supply Chains Can and Must Be Eliminated," [theguardian.com](http://www.theguardian.com/global-development/2014/jun/11/slavery-supermarket-supply-chains-eliminated), June 10, 2014, <http://www.theguardian.com/global-development/2014/jun/11/slavery-supermarket-supply-chains-eliminated>.
2. "Global Food Traceability Market (Tracking Technologies) to Reach \$14.1 Billion by 2020—Allied Market Research," PR Newswire, January 15, 2014, <http://www.prnewswire.com/news-releases/global-food-traceability-market-tracking-technologies-to-reach-141-billion-by-2020---allied-market-research-240267801.html>.
3. Gib Brogan. "Looking at the Labels: Traceability in the Seafood Industry," <http://www.seafoodsource.com/en/commentary/110-resources/webinars/24227-looking-at-the-label-traceability-in-the-seafood-industry> (requires free registration to access).
4. Spencer Henson, et al., "Traceability in the Canadian Dairy Processing Sector" (Agriculture and Agri-Food Canada: October 2005), <http://publications.gc.ca/collections/Collection/A21-53-3-1E.pdf>.
5. "Seafood Traceability: A Weighty Issue" (justFoodERP: August 2013), <http://www.seafoodsource.com/en/seafood-traceability-weighty-issue> (requires free registration to access).

Appendix

Traceability Vendor Benefits Grid

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|--------------------|------------------------|--|--|--|---|---|
| BackTracker | BackTracker / FishTale | A traceability and management platform that collects catch and landings data and stores them in a secure data bank. The owners of the data—fisheries and independent fishers—control who has access to the information and how it is shared. | Map viewers enable companies to visually track products as they move through the supply chain. | Users can measure and monitor catch and effort; spatial planning; regulatory measures; and changes in biomass, seafood traceability, and COC (chain of custody) auditing. The software also enables track and trace and the ability to communicate the authenticity, quality, and sustainability of seafood. Also enables assessment of quota and ACE (annual catch entitlement) portfolios. | A dashboard allows producers to source available quota to balance catch, access trading prices and interested buyers for their catch on the fly. The BI (business intelligence) dashboard is constantly evolving as new and improved data get uploaded into the system. | Web templates allow companies to upload and publish images and other information about their products, which are tied to each product via QR code. Consumers scan a label or menu with their mobile device and are taken to a custom web page that can include anything from a picture of the boat and crew that caught the fish to customer endorsements to recommended recipes. There is also the ability for the QR code to trace product throughout the supply chain and link each unique trace back to the source where it was caught. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|---------------------------------|----------------------|---|---|---|---|---|
| Computer Associates Inc. | Seasoft ERP Software | A fully integrated seafood-specific Windows-based enterprise resource planning (ERP) software solution with comprehensive lot tracking that facilitates product traceability at various points in the supply chain. Software also integrates with Trace Register. | Enables viewing of inventory in multiple warehouse locations. Seasoft tracks individual bins, containers, and packages as they flow through the manufacturing process and distribution chain, and provides historical information related to supply chain, production, inspection, genealogy, and usage. Seasoft's integrated traceability module uses RFID and barcode technology to track product as it is received, processed, and moved through the supply chain. On-demand vendor information, lot numbers, PO, expiration date, country of origin, method of production, and other tracking information offer quick and thorough product recalls. | Automatically calculates true yield and margin on all products. Production packing solution with integrated scale interface and by-product costing for obtaining true production yields; lot tracking for traceability through manufacturing steps; barcode labeling; shellfish tagging; warehouse management for real-time inventory control, material resource planning module with raw material and packaging planning for recipe processing; quality assurance module; dispatch and delivery module with e-signature capture on mobile devices and barcoding for order/shipment verification. | Allows executives and managers to access company data wherever they work, visualize it in easy-to-read graphs and charts on customized dashboards, and analyze it to make new discoveries. From sales, inventory, and customer profitability to vendor performance, A/R, lot detail, and more, everyone in an organization can access the data they need from all sources to make better decisions. | Offers a browser-based lot-tracking and traceability smartphone application called SeaTrace that gives consumers and retail buyers on-demand access to detailed information about the seafood they're purchasing. The SeaTrace app utilizes quick-response (QR) labels and advanced technology that, when scanned on a smartphone, presents full color images of the captain and boat that caught the seafood, as well as information about when and in what region it was caught—even nutritional information. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|------------------------|--|--|---|--|---|-------------------------------|
| Fish Trax Systems Inc. | Fish Trax | An electronic fishery information platform that helps industry, marketing, and fishery managers collect, analyze, and share information. | | | | |
| | Fish Trax Fishermen's Portal (login required) | A secure portal that allows fishers to keep track of their stock. | Fishers can manage their inventory using a variety of search, sort, and visual mapping functions. | Fishers are able to analyze CPUE (catch per unit effort) and sea surface conditions to inform operations and help minimize expenses. | | |
| | Fish Trax Fisheries Management Portal (login required) | Helps fisheries managers at the state and federal levels to analyze aggregate data. | | | Analyzing aggregate data can help inform management decisions in real time or near real time. | |
| | Fish Trax Public Portal | Provides access to aggregate catch data collected by fishers participating in the Collaborative Research on Oregon Ocean Salmon (CROOS) and West Coast Stock Identification. | | | | Educates public on fisheries. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|--------------------------|----------------------------|--|--|--|--|---|
| Junction Solutions, Inc. | JunctionFB | JunctionFB is an ERP software solution that provides end-to-end tracking of seafood products. | Manage product expiration dates through advanced inventory control. Manage multiple locations and transfer inventory from one location to another to cost-effectively fill orders. | Gain visibility across countries and across currencies to obtain accurate operational data. JunctionFB is fully integrated with the general ledger, so information from the production line and the warehouse is immediately visible to accounts receivable. | The ability to analyze critical tracking elements and other core business data such product ingredients, packaging, storage, transfer, and shipping information can drive insights about logistics, labor and other operational issues | JunctionFB Trade Promotions Management (TPM) module provides visibility and control over trade promotions to increase effectiveness of promotions and potentially increase revenue. |
| Norpac Fisheries Export | Norpac Traceability System | An end-to-end traceability platform that utilizes a barcode for each fish, allowing fisheries managers to trace exactly where the fish comes from, when it was unloaded, and its species and weight. | All fish are assigned a unique serial number, and critical information is recorded at the vessel or dock. At receiving, the fish are individually graded and tagged with human-readable data. Each piece can be traced at any time to the original fish from which it was cut. | Each fish is issued individually to processing to fulfill a specific order, and many are pre-tagged for specific customers. Fish are ready for finishing cuts to exact customer specifications. | | |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics Marketing |
|-----------|--|---|--|--------------------------|--|
| Olrac SPS | Olrac Electronic Logbook Software Solution | An advanced electronic logbook (eLog) software solution for collecting, analyzing, plotting, mapping, reporting, tracing, and transmitting all vessel-related data, customized for the commercial fishing industry. | The electronic logbook includes a data collection and tracing system for commercial fishing operations. Can collect any type of data in any form: images, video clips, numerical and alphanumeric fields, free text comments, date, time, location, etc. | | Olrac GIS is an optional visual data analysis module that analyzes subsets and data. |
| | Olrac Dynamic Data Logger | An onboard electronic logbook software solution for capturing, managing, and reporting on all marine-based activities. | The Olrac DDL system tracks in real time all catches, movement of fish (load and offload), stock on board, fish products, packing methods and materials, process to live weight conversion, fish quality, and more. | | |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics Marketing |
|---------------------|----------------------------|--|---|--|--|
| | Olrac Dynamic Data Manager | A complete web-based, vessel registry and quota management system. | Olrac DDM includes a quota management system, summary reports compiler, vessel registry system, and extensive data customization utilities. The system allows the administrator to see, in real time, incoming reports from various vessels into Olrac DDM. Olrac DDM also incorporates Google Maps to graphically visualize vessels and catch locations. | Olrac DDM allows for the generation of EU-compliant reports for member states. The server system can generate reports in any format required by the IFDIS and VMS systems for viewing or storage purposes. | Olrac GIS is an optional visual data analysis module, which analyzes subsets and data. |
| Ridium Technologies | SeaTouch | A touch screen-based ERP software for seafood processors, distributors, and importers. | Users can track items by warehouse, sub-inventory, or stocking location. Permits unlimited units of measure for each item. | Can be accessed from any web-enabled device; software automatically records any type of transaction for each product, including location changes, sales, or returns | Integrates with Microsoft and other third-party BI tools. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|---------------------------|-----------------------|--|--|--|---|---|
| ScoringAg Inc. | ScoringAg | A web-based, global database management system that provides supply-chain partners with traceback and traceup record keeping and documentation for HACCP and FSMA. | Site-specific (GPS with auto date and time) recordkeeping tracking technology traces real-time fish movements through confined locations, giving weight, sizes, and/or counts at all fish/shellfish locations of movement. | Patented 2D barcodes and mobile GPS label-printing devices give users immediate retrieval and scanning of site-specific records by reading/scanning barcodes and RFID chips. | ScoringAg includes an algorithm that detects abnormal data patterns regarding vessel behavior such as dock location and date/time of submissions. These types of analytics are used to detect abnormal spending patterns, identify product relationships, and better predict retail demand. | The database covers from catch to table all data points; consumers can use an entry code on Traceback.com to see value points. |
| TerraMar Innovations Inc. | Fish Trax Marketplace | A consumer-facing mobile application that connects fishers, processors, consumers, and retailers. | | | Retailers and processors can collect direct customer feedback. | Consumers can learn about where their fish comes from and connect with local businesses; retailers can create marketing materials to promote their businesses; dealers can broaden their exposure; dealers and retailers can engage directly with consumers and learn what they are thinking. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|----------|----------|--|--|--------------------------|--|---|
| ThisFish | ThisFish | A web-based traceability tool for uploading catch information, including the unique codes that are used by consumers to trace their catch. | When landing their catch, fishers tag individual fish or entire fish lots with a unique code. Information about the fish, such as who caught it, where, when, and how, is uploaded to the database through the web interface and linked to that unique code. As the fish travels through the supply chain, other seafood businesses upload additional information about how it is handled and processed. | | Fish harvesters have their own digital dashboard at Thisfish. info that allows them to monitor tracing activity, including an interactive world map that shows from where their catch is being traced. | Fishers create their own online profiles with stories, images, videos, links, vessel and crew information, and more, which is used to personally brand their catch. Processors and buyers can create local and regional seafood brands, promoting the unique qualities of products from different regions. A tracing “widget” lets customers trace fish purchases directly from the business’s own website. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|-----------------------|----------------|---|--|---|--|---|
| Trace Register | Trace Register | A web-based, on-demand application that meets the full traceability requirements of producers, processors, and distributors, as well as food service operators and retailers of wild and farmed seafood. It functions as an independent, third-party registry into which product source and traceability information is entered, secured, and shared among companies throughout the supply chain. | The digital traceability system gives companies at each step in the supply chain the ability to record and share structured data in a confidential and secure way. Important documents can be easily loaded and stored in the Trace Register database and reviewed by authorized users at any stage of the supply chain. | A data check module automatically monitors and analyzes structured data as it is recorded into the digital traceability system. A rules engine runs rules automatically and results are displayed in near real time, improving the efficiency and effectiveness of critical business oversight. | The data check module measures and analyzes data quality to facilitate improvement over time, and generates alerts to proactively drive action and prevent problems. | A marketing module lets customers interact directly with consumers. QR codes direct consumers to a mobile landing page or website where they can learn more about the product they're purchasing. |

Features Specific to:

| Vendor | Product | Description | Inventory Management | Operational Efficiencies | Business Intelligence / Analytics | Marketing |
|-----------------|----------------------------|--|---|---|--|---|
| Traceall Global | Fishtrace | | Tracking technology extends visibility down to the product level in the transit vehicle itself. | Traceall's Product Integrity Monitoring System (PIMS) helps retailers improve supply-chain efficiencies. The software can capture location, temperature, impact, humidity, vibration, pressure, or any other measurable data variables, which retailers can access at any time. | Real-time tracking of location, temperature, and other variables provides full visibility into transit, with alerts that can prompt preventive action. | Customized reports and brand-specific web portal. |
| | TraceAll Supplier Exchange | A web-based supplier management tool for supermarkets and restaurant chains. | The solution improves supplier management and allows companies to create a complete audit trail of the ingredients, sources, production conditions, and other elements of the inventory they're purchasing. | | | |



FUTURE
of **FISH**