

# I. THE INNOVATION AND IMPLEMENTATION PROCESS

Successful technology innovations, including intelligent freight innovations, follow a four-step process from “bright idea” to acceptance as “best practice.”

1. **THE BRIGHT IDEA.** The innovation may come from users who are wrestling with an operational or business problem, from a technology supplier, or from collaboration between a supplier and a user. The bright idea, perhaps turned into a prototype, is the starting point. A proof-of-concept may mark the transition to the next stage.
2. **TESTS AND DEMONSTRATIONS.** Tests vary in scope, thoroughness, and formality of evaluation. They usually go through several iterations, growing in scale. Our industry partners tell DOT informally that test results and data, especially independent test results, are important tools to help managers decide whether to move to the next stage.
3. **INITIAL ADOPTION.** The decision by a market leader to implement the new technology or process is a critical milestone. The leader may deploy in stages, moving from a pilot project to progressively larger roll-outs, but the context is implementation, not more testing. As more early adopters succeed, the project or solution moves from a high potential test result to a new industry best practice.
4. **WIDE ADOPTION.** This step cements the transition to “best practice” status as mainstream firms embrace the success and follow the example of the market leaders. The total benefits to the economy multiply as more transportation firms and their customers reduce costs or increase quality.

Once there is a clearly defined bright idea, the biggest hurdle is building sufficient confidence in the solution to precipitate a decision for initial adoption. The next sections address the trigger factors that lead to such decisions and the barriers that impede them.





*Traffic management centers, like this one, use data from road sensors, cameras, and other sources to adjust traffic flow.*  
Source: FHWA

## TRIGGERS FOR IMPLEMENTATION

There are three big triggers for business implementation of intelligent freight technologies: 1) pursuit of competitive advantage, 2) keeping up with competitors, and 3) compliance.

**Pursuit of competitive advantage** for sustainable profitability is the main and preferred trigger for market leaders and innovators. Their strategies may focus on greater efficiency (cost reduction), more effective service (revenue enhancement), or better shipment integrity (risk management), but are likely to cut across and blend several of these strategies. Regardless of the mix, market leaders and innovators seek to improve a firm's standing and profitability in the marketplace. Of course, all firms are concerned about their competitive standing and profits, but the dynamics are different for market leaders and market followers.

The critical element of any change in business is a credible business plan—the ability to articulate and demonstrate that a proposed change has value. There may be a tug of war between visionaries and skeptics about what constitutes credibility, but in most cases, they agree there is a need for quantitative analysis and expected return on

investment (ROI). Market leaders, however, are willing to blend more qualitative judgments into that mix.

Good business plans for intelligent freight technologies look beyond the direct costs of the innovation itself. Because these technologies usually change the way business is done, good business plans address the innovation's operational and incidental effects on the business process. In a classic example of looking beyond the numbers, a landmark decision to implement satellite-based tracking in a large trucking company hinged on a qualitative judgment by the Chief Executive Officer (CEO) that being among the first to deploy satellite fleet management technology would prove to be a market differentiator.<sup>1</sup>

**Keeping up with competitors** seems to be a more important trigger factor for market followers. Market leaders have already mastered—or survived—the bleeding edge of innovation and are reaping benefits in the marketplace, perhaps in operating ratios and profitability, perhaps in revenue and customer gains. Success by market leaders progressively erases doubt and skepticism about new solutions, and shifts the debate in other firms from *whether* to *when and how*. Internal skeptics may still challenge cost estimates and benefit assumptions, but the dynamic is different after senior management decides that competitors x and y are forging ahead based, to some extent, on technology and process innovation.

**Compliance** may arise from customer demands as well as government regulations. We know neither situation is easy because both involve an element of force, yet in some cases, compliance triggers an innovative profit orientation, not just an accommodation to a demand.

Commercial compliance comes into play when a major customer demands innovation as a condition of doing business. The best examples today involve passive RFID tags.

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<sup>1</sup> Informal statement of a former president and CEO of the trucking company.



In 2003, Wal-Mart and Target separately required their top suppliers to begin applying the tags to cartons and pallets by January 2005. In 2004, Boeing and Airbus went further, jointly requiring their suppliers to add tags to next generation aircraft and engine parts. Although the trade press is rife with articles about the lack of return on investment for RFID implementation among suppliers, the return is almost beside the point. The crucial trigger question for its big suppliers is not “*will we achieve enough benefit internally from RFID?*” But “*since we won’t walk away from this customer’s business, how do we manage this investment and get something out of it internally if we can?*”

Regulatory compliance can be a blunt trigger in the case of new and modified mandates. The 24-hour advanced manifest rule for ocean container imports required action by shippers and carriers in 2002. There were choices about how to comply, but not whether to comply. If the universal Electronic Freight Manifest (EFM) were available when the 24-hour rule was mandated, then the new manifest rules might have made adoption of EFM a relatively easy choice. Even without EFM, new U.S. Customs and Border Patrol (CBP) manifest rules for land shipments may influence a decision by more shippers and carriers to adopt transponder-based systems for cross-border facilitation. A more dramatic and hypothetical example to consider is a sudden shift in the regulatory environment after a freight-related terror incident, with the U.S. Department of Homeland

The Electronic Freight Manifest (EFM) project is one of DOT’s high priority freight initiatives. It is designed to test improvements in speed, accuracy and visibility of freight information exchange between supply chain partners and to evaluate the benefits to government and industry. Specifically, the EFM will test and evaluate 1) standardized electronic messages that are shared between business partners, 2) a concept for transferring information through the Internet with linkage to the entire supply chain, 3) a system architecture to define the linkages to all user parties in the supply chain, and 4) a business case to define rules and procedures for supply chain partners participating in the deployment test. The project will be completed in 2006.

Security (DHS) mandating deployment of the best available smart trailer or smart container technologies.

The compliance trigger can be more subtle for established regulations. Highway permitting requirements and weight limitations predated RFID technology, so there was no sudden requirement for carriers to sign up for RFID compliance facilitation programs. In this case, the more traditional triggers applied within the context of a regulatory framework: “If states are installing reader networks, then shall our company invest in the RFID hardware and database modifications to participate, and what would be the benefit to our company of participating?”

*This RFID transponder is mounted in the cab of a truck to relay vehicle identification information to an electronic reader at the roadside. The roadside inspection station then sends clearance or other information back to the driver. Source: FHWA*



## BARRIERS TO IMPLEMENTATION

There are technical and institutional barriers to the acceptance of new technologies and operating practices in most industries. Some barriers for intelligent freight applications, however, may be more complex when decisions by private firms depend on government budgets and actions.

Concerns must be addressed on several levels: at face value, as legitimate issues, in terms of perception versus reality, and in terms of underlying concerns. The last point recognizes that a potential user or stakeholder may be most concerned about the cost of a customer's new technology demands but finds it more politic to raise issues about technical performance and the quality of maintenance cost forecasts.

**Efficacy** is the fundamental concern. Does the new process work, does it work as advertised, and do potential users perceive that it works? Is the solution stable and is the underlying technology sufficiently mature? A second-order benefit concern is whether businesses and their contractors have the skills and resources to implement the new process successfully?

Concerns about **standards** and technical regulatory regimes, such as radio fre-

quency access, reflect a more general concern about the acceptance of a solution in all critical geographic areas. That varies from a concern about non-interoperable compliance facilitation systems, such as toll tags, to the ability to use a single container security device in all major trading nations. Another manifestation is that some firms may resist open network freight data hubs or moves to data standards in order to protect a proprietary information.

Managers may raise questions about and objections to potential negative **operational impacts**, such as the need to inspect and replace batteries in the field or the difficulty of managing a mixed fleet during a deployment and transition period. Executives of information technology (IT) companies may be concerned about the unanticipated impacts on legacy systems and interfaces with supply chain partners as a result of proposed supply chain data sharing requirements.

Skepticism about investment and operating cost estimates is the primary **cost** barrier. The secondary cost barrier may be a corporate focus on return on invested assets, which can discourage investment projects.

#### CONCERNS AND BARRIERS TO IMPLEMENTATION

- Efficacy and technical immaturity
- Standards and acceptance
- Operational impacts and systems integration
- Cost
- Business case and benefits
- Exposure to government action and inaction
- Protection of proprietary information
- Reluctance to change

The **credibility of the business case** is often a major barrier and the dominant concern. Skepticism about quantitative benefit estimates seems to reside in the DNA of most corporate comptrollers. Skepticism about soft and qualitative benefits can be even more profound, especially among senior executives who may not have personal experience related to the particular project.

**Exposure to government actions** and inaction adds barriers for some intelligent freight projects. For example, dependence on public sector funding and implementation for public infrastructure is a concern for some short-range asset tracking solutions. In another area, lack of clarity about security regulations is a barrier for deployment of security-related tracking systems.

Most private firms are intensely protective of **proprietary information**. Intelligent freight projects that address freight status information can raise concerns about inadvertent exposure, especially in open network systems, and about vulnerability to tort discovery and Freedom of Information requests. These concerns apply as much to private-sector data hubs as to public-sector hubs.

**Resistance to change** is the final barrier. The motivation may be thoughtful (“*let’s let someone else take the big risks first*”) or habitual (“*it works well enough now*”), but inertia is a factor.

There is an interesting interplay between the triggers and barriers. For example, market leaders, searching for competitive advantage, seem to concentrate on efficacy, operational effects, and the credibility of the business case, but the barriers seem to be framed as interesting challenges and opportunities. Market followers, with more of an emphasis on caution, seem a bit stymied, almost intimidated by the same barriers until wrenched into action by competitive necessity.



