

# Data Capture in Transportation and Logistics

---

WHITE PAPER

Sponsored by: OKI Data Americas

Simon D. Ellis  
February 2009

---

## MANUFACTURING INSIGHTS OPINION

Manufacturer supply chains are becoming longer and more complex and have real challenges getting timely and accurate information to the right place at the right time. These globally distributed supply chains present the largest challenge to the transportation and logistics organizations whose efforts to make operational and execution processes more efficient and effective are regularly hampered by late, inaccurate, and incomplete data caused in large part by the inefficient transfer of logistics data through the use of manual forms and input to capture that data.

Although the use of digital capture devices appears slightly more mature in the transportation and logistics part of the supply chain, there is still the view that substantial improvements can be made in the business process. While nearly 80% of logistics functions still use paper forms and 52% of the data is input manually, more worrisome is that one-fifth of the data captured manually is not entered at all. This leaves only 28% of the data being entered either with a digital scanning process or through the use of a digital pen. Certainly, this lack of automation is contributing significantly to the poor level of data accuracy and corresponding shipping errors within transportation and logistics.

The benefits of moving to digital capture of transportation process data are significant. Respondents identified improvements in their ability to store/retrieve information, improved process efficiency and lower costs, improved data accuracy and timeliness, as well as a more robust form of signature capture for regulatory compliance. This last point is significant as we are seeing a lot of interest in governance, risk, and compliance (GRC) in the supply chain in general and in logistics specifically. Management of trade and customs compliance, anticounterfeiting, and supply risk management are all increasingly dependent upon accurate transportation process data to function seamlessly. It is the view of Manufacturing Insights that automated, digital capture of logistics data is a critical foundational capability to effectively manage GRC and a distributed global supply network.

## IN THIS WHITE PAPER

In this white paper, Manufacturing Insights, an IDC company, looks at data capture within the supply chain, transportation, and logistics functions. It is our premise that as global supply chain networks grow more complex, the challenges inherent in both initially capturing and then inputting critical shipment data become an enormous problem. Interestingly, the scope of this problem is often not fully appreciated by manufacturers.

For the purposes of this paper, we are defining data capture in transportation and logistics as a three-step process of sending, receiving, and storage of data. Sending, or the outbound movement of transactional or tracking data, can be an internal exchange (for example, replenishment shipments within a manufacturing network) or a handoff from a third-party logistics provider or contract manufacturer. Receiving, or the inbound movement of data, can also be either internal or a handoff to a third-party logistics provider or contract manufacturer. Storage is then the permanent capture of both sending and receiving data within the systems infrastructure so that it is available to the logistics and broader supply chain business process.

Organizations continue growing their businesses and trading relationships in new regions of the world, with both existing and new supply network partners, further complicating their existing data capture challenges. Corporate risk and country-specific data failure costs increase with each new geography. Transportation and logistics providers are wrestling increasingly with data requirements and data accuracy, particularly as they face tougher cost environments and greater service-level expectations.

In this white paper, Manufacturing Insights presents the case for leveraging automated data capture technology and business process within transportation and logistics. We base our opinions and guidance on insights from the ongoing interaction we have with both transportation providers and manufacturers, as well as a market survey we conducted specifically in support of this white paper.

---

### Summary of Key Findings

Some of the key findings from our survey of 50 transportation companies are as follows:

**Finding #1 — Over 96% of transportation companies still use a combination of paper and electronic forms.** Putting a computer on every desk in the warehouse and mobile devices in the hands of logistics and transportation personnel in the field has not eliminated the use of paper. Particularly in the case of outbound shipments, the use of paper forms is still ubiquitous and presents a significant opportunity for improvement.

**Finding #2 — Nearly 80% of functions use paper forms.** Many processes that do not rely completely on paper forms have some paper-based component.

**Finding #3 — Approximately 31% of forms are still printed centrally or purchased externally.** This is a huge problem in warehousing and logistics operations, where the frenetic nature of fulfillment often results in boxes of forms getting lost, misplaced, or just stuffed in corners and closets, under check stands, and in many other places only to be discovered in annual or biannual inventory checks.

**Finding #4 — Data acquisition is still immature.** Fifty-two percent of the data acquisition is done manually. Seventy-two percent of forms require input into electronic systems — which incurs avoidable labor costs.

**Finding #5 — Greater focus.** The business process usage of paper forms in transportation appears to be less than in either manufacturing and retail, suggesting that there has been a greater focus in data capture automation.

---

### **Summary of Recommendations**

The opportunities for using modern digital technologies to better capture and store transportation- and logistics-related data are significant. Data capture remains an issue (with 20% of data not stored) along with rampant data accuracy problems. Companies that understand both the accuracy level of their data and its importance to cost and service levels are increasingly using automated data capture techniques or are requiring that capability from their logistics partners.

Manufacturing Insights recommends that transportation companies take the following actions:

- **Assess the size of the prize.** Undertake a strategic assessment of transportation and logistics to understand how inaccurate the data may be. Experience has taught us that the situation is almost certainly far worse than the business thinks; therefore, the potential improvements have equally been underestimated. This assessment also allows the business to identify the most pressing opportunities and some quick wins.
- **Educate.** Most logistics personnel at the execution level we talk to have very little appreciation for the value of accurate data and even less understanding of the negative business impact on service and profitability.

- **Encourage a data culture.** Best-in-class companies have embedded a "data culture," typically by implementing information acquisition improvement initiatives.
- **Conduct a business process review.** We do not suggest that best-in-class companies have fully eliminated paper forms, but they have implemented a broad strategic review across all logistics business processes to transform data capture in critical areas.
- **Determine the appropriateness of technology.** Once a business has decided where to focus and with whom, the tactic becomes one of mitigation. Is a technological solution appropriate, or can the problem be more economically solved by applying labor?
- **Know the tools in the toolbox.** We see best-in-class companies taking a multifaceted approach based on role and need — in other words, evaluating the specific problem and using the best technological "tool in the toolbox" to solve the problem.

## **METHODOLOGY**

This research was sponsored by OKI Data Americas and conducted by Manufacturing Insights. The primary research component of the paper consisted of formal surveys with IT directors from 250 firms across the manufacturing, transportation/logistics, and retail industries in North America. To be included in the study, the firms had to have more than 1,000 employees. Each respondent was screened based on involvement with relevant technologies and business processes at his/her firm. Results of the study are presented in aggregate in the figures throughout this paper. Extensive secondary research was also performed by Manufacturing Insights in the course of preparing this study.

Manufacturing Insights feels strongly about the business value of the types of solutions discussed in this analysis. However, this paper is not intended to recommend any specific solution or vendor.

## **SITUATION OVERVIEW**

---

### **The Modern Supply Chain and Implications for Data Capture Accuracy**

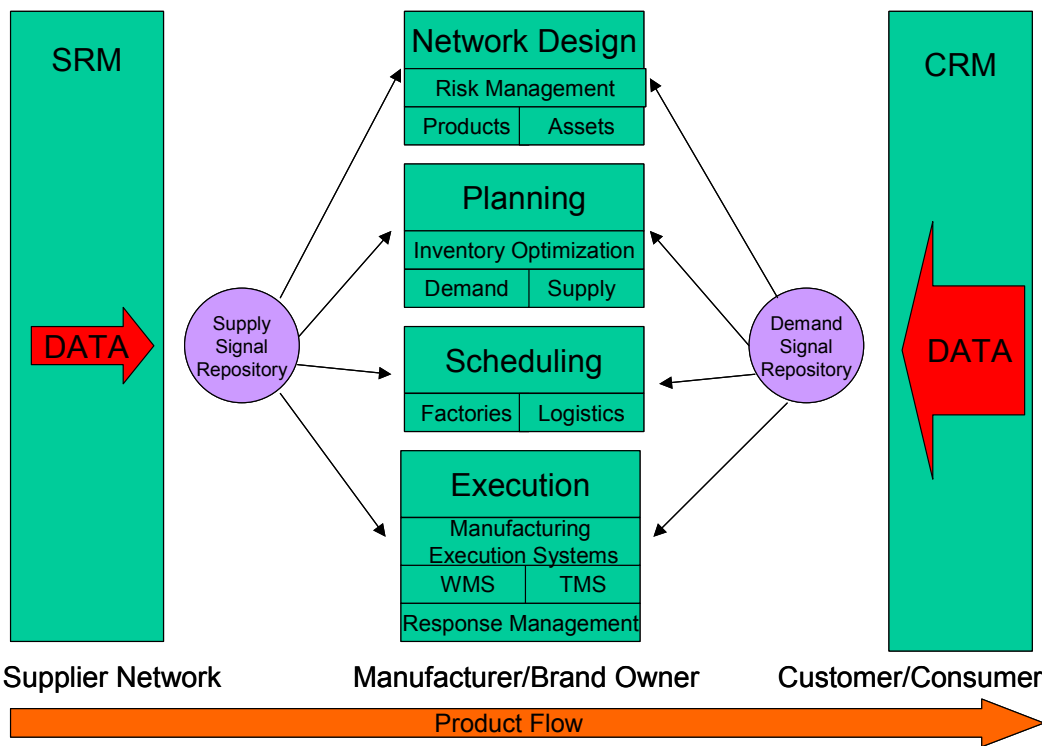
Current supply chain organizations manage a level of complexity in their business that is unparalleled. Cost and core competency pressures have resulted in distributed supply networks that can be five or six suppliers deep with both global trade and distributed control challenges. Customer differentiation and consumer preferences have driven SKU numbers, product ranges, and configuration variants through the roof, while expectations about on-time delivery, delivery frequency, inventory levels/turns, and service performance (the perfect order) get tighter and tighter.

At the same time, more and richer data is available to the supply chain, which is struggling to identify what data is useful, how to collect and analyze it, and what the resulting information can be used for in short-, medium-, and long-term supply chain operations. Complicating this situation are chronic data accuracy problems — primarily with foundational master data and transactional logistics data.

Figure 1 illustrates what we are calling the "modern supply chain." From one perspective, we show the horizontal, extended supply chain where product supply networks interact with the manufacturer (or "brand owner") to provide products to the customer/consumer. From a second perspective, we show the manufacturer supply chain vertically by process and application area.

**FIGURE 1**

The Modern Supply Chain



Source: Manufacturing Insights, 2008

The modern supply chain must be prepared to handle the proliferation of data. Although most of the conversations around data have focused on the demand side, we believe the supply side is an equally important source of data as well, particularly with the growing complexity of

supply and distribution networks and the corresponding control challenges. The expected focus in 2009 on the "execution suite" (warehouse and transportation management systems, manufacturing execution systems, and response and order management) intensifies the need for better, more timely information. Figure 1 differentiates the "supply signal repository" from the "demand signal repository" for graphical purposes, although it is likely that both groups of data will reside in the same database — ideally an enterprise-level data repository. In our research, we have talked about the "data life cycle" (identify-acquire-analyze-affect) and have made the point that while a common data repository is important, ultimately an impact is made only if the supply chain can execute differently as a result of insight gained from the data — thus the linkage back to the vertical supply chain processes.

It is in the "acquire" phase of the data life cycle that we see data capture problems that lead, in part, to the chronic data accuracy issues — issues, incidentally, that most manufacturers discount as being far less problematic than they really are.

---

### **Transportation and Logistics Challenges**

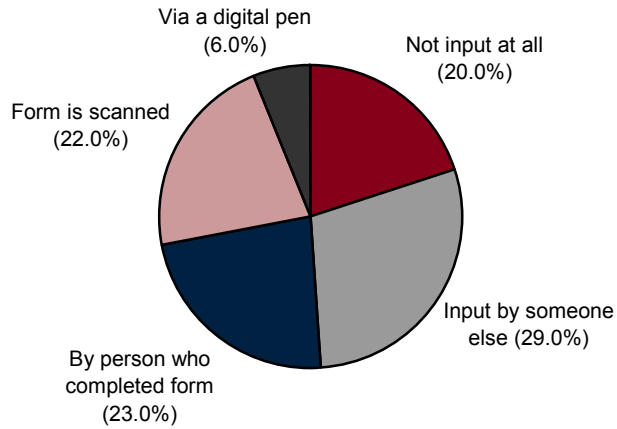
One consequence of globally distributed supply networks is the growing complexity of the transportation and logistics process. While we would like to think these global networks are efficient, the reality is that efficiency has been largely defined by manufacturing costs, not by transportation and logistics costs. In our research on profitable proximity, we see manufacturers increasingly looking at "total landed cost" in their sourcing network decisions with an eye to simplified transportation. This will take some time to play out, however, and legacy transportation networks will predominate for some time. Regardless of transportation and logistics network complexity, better data capture leading to improved data accuracy is a pressing challenge.

Transportation and logistics remains hampered by manual forms processing, although the business process usage of paper forms does appear to be somewhat less than in either manufacturing or retail. This finding suggests that there has been a greater focus on data capture automation — perhaps driven by the longer history of capability outsourcing in transportation and logistics. That said, transportation providers still indicated in the survey that nearly 80% of functional areas persist in their use of paper forms and that 52% of the data is input manually (see Figure 2). Particularly troubling is that one-fifth of all captured data is not input into any kind of automated system ("storage" of data).

## FIGURE 2

### Data Input Is Still Immature

Q. How is the data from paper forms input into an automated system?



n = 50

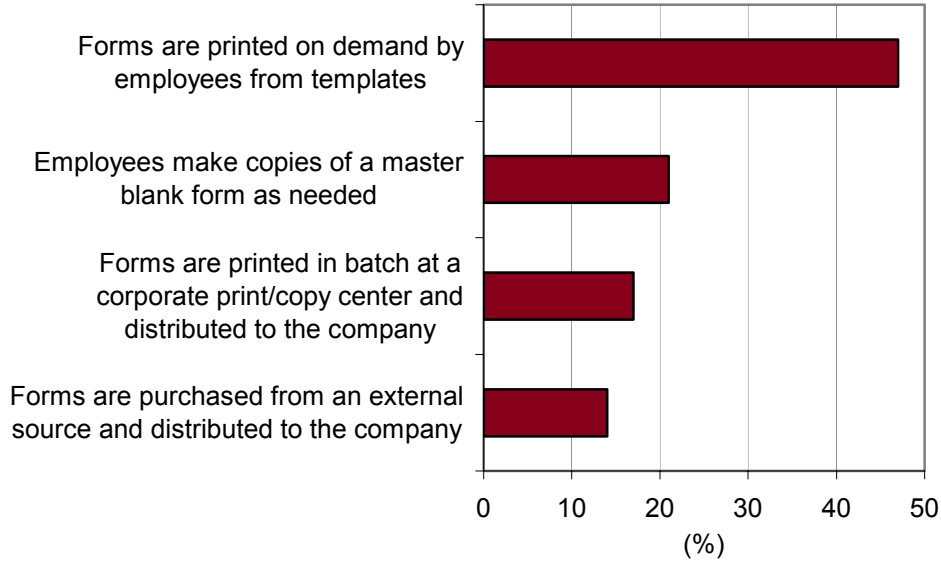
Source: Manufacturing Insights, 2008

Interestingly, a sizable percentage of forms also are used that are either bought or printed centrally (see Figure 3). In this age of online forms and ubiquitous printer access, this finding is quite surprising. It certainly suggests that a number of older legacy business processes as well as opportunities to significantly improve performance persist in transportation.

**FIGURE 3**

**How New Forms Are Produced**

Q. *If you have not eliminated paper forms entirely, please provide estimated percentages for how new forms are produced.*



n = 50

Source: Manufacturing Insights, 2008

Specific areas are challenged, particularly the outbound shipment process where the ability to capture pallet and case information, prioritize deliveries, and manage load consolidation is consistently compromised by poor data accuracy. This becomes problematic when overseas or transborder shipments are involved. Table 1 indicates those areas of transportation where manual forms usage is still material and, more interestingly, where automated data capture provides significant improvement opportunities.

**TABLE 1**

**Less Forms Usage in Transportation, but Still Improvement Opportunities**

Process	Manual Forms Usage: >2.5 = Still a Factor	Improvement Opportunity: <2.5 = Significant
Overall transportation	2.25	1.88
Outbound shipment	2.57	1.90
Arrival confirmation	2.22	1.85
Demurrage/delay communication	2.11	2.03

Source: Manufacturing Insights, 2008

The outbound shipment process (capturing of pallet, case, and unit data; packing list information; delivery priority; and consolidation instructions) is most notably highlighted by respondents as still having a significant level of manual forms usage — and having a significant opportunity for improvement with the use of digital data capture technologies. Data errors here routinely result in shipment errors, overs/shorts, and corresponding receiving errors. Many of these errors can result in delayed or no payment, which then drives a time- and resource-consuming audit and dispute resolution process.

Although arrival confirmation was a bit lower in terms of overall manual forms usage, it was identified by respondents as the process that would most benefit from the use of digital data capture technologies. This finding is significant as the arrival confirmation (either at the front gate or at the warehouse dock door) for customer freight triggers a number of financial processes, including starting the clock on invoice payment terms as well as potential delay/demurrage charges.

We also see companies that have applied lean thinking to logistics perform better than their peers, in terms of both overall cost and service-level performance. Part of the improvement here has been to focus on data accuracy, in terms of governance (who owns each piece of data), partnership with key third-party logistics providers, and the elimination of manual data entry.

Transportation and logistics companies consistently agree that there is opportunity for significant improvement in the data capture process. Companies see substantial benefits in areas where they have applied digital capture/automated capture technologies. The survey results indicated clear benefits in the ability to retrieve and improve data accuracy and timeliness, as shown in Table 2.

<b>TABLE 2</b>	
Top Benefits Identified for Use of Digital Data Capture	
Benefit	% of Respondents
Ability to store/retrieve information	43
Process efficiency/lower costs	29
Data accuracy	29
Timeliness of data	28
Authorized signature capture for regulatory compliance	25

Source: Manufacturing Insights, 2008

Clearly, the ability to store and retrieve information is most important to transportation and logistics organizations. We have mentioned it before, but the fact that 20% of recorded data is not stored is shocking — the cost impact to the businesses is difficult to measure, but we believe it to be material. Cost savings, primarily in the form of labor savings, is important, although it does not appear to be adequate to fully cost-justify full investments in digital data capture technologies. We had expected that data accuracy and timeliness would have been rated higher in importance, but that may simply be a result of businesses generally not having a complete view of data quality. The inclusion of a signature for regulatory compliance is a particularly interesting benefit as it highlights the increasing focus on governance, risk, and compliance in the global supply chain. We were a little surprised that there was no mention of sustainability/environmental impact as a benefit from digital data capture given the preponderance of "green talk" in the supply chain at the moment.

## **FUTURE OUTLOOK**

---

### **Technology Scenarios**

Potential benefits of modernizing forms processing and data capture are clearly indicated across multiple functions within transportation and logistics. Even where manual form usage is considered to be less of a factor, survey respondents still suggested there are significant areas for opportunity. As we have observed in this document, these areas include outbound shipments, arrival confirmations, and communication of demurrage/delays — three critical areas for transportation and inefficiency that can drive significant supply chain cost/waste.

Available technology options are fairly broad, with a mixture of different solutions most likely within transportation. Where people remain an integral part of the business process and/or an authorized signature is required, digital pen or scan-based capture is likely to be most useful. Where people are less of a factor (e.g., identifying a trailer within a warehouse drop lot), a more automated form of data capture such as RFID or GPS may be more appropriate. Broadly, we see the following pros and cons for each technology:

- **Scan-based capture** can be useful in a transportation and logistics environment, although it tends to be an "after-the-fact" approach that inputs forms that were manually completed during the particular business process. Form scanning is not, for example, easily or practically done at the dock door of a warehouse. This is a fairly mature technology, however, and appears to often be the choice when cost or technological sophistication considerations are important.

- **Digital pen/tablet** technology is the most interesting technology for automating data capture in many transportation and logistics processes. It is portable and fits nicely with the level of personnel interaction that characterizes many transportation processes such as arrival confirmation, unloading completion, or dock departure. Given the technology's relatively high penetration among global logistics providers such as UPS and FedEx, we continue to be surprised by its relatively low penetration among more traditional freight haulers.
- **Automated data acquisition (barcodes, RFID, sensors)** is certainly getting its fair share of press, but we see this technology as most appropriate for asset tracking applications rather than for transactional business process applications. Certainly, RFID tags applied to trucks/trailers could be used to confirm arrival at a destination point (front gate of a distribution center or the actual dock door) or to locate within a drop lot facility, but they are less useful when a confirmation signature is needed or when a business process has been completed. Most automated data acquisition technologies also have a fairly high infrastructure cost — given the need for readers and data processing hubs — and though costs have come down, the application of these technologies is still fairly low.
- **Integrated communication technologies (EDI, GPS)** are in heavy use by many third-party logistics providers to offer real-time asset tracking and arrival/departure verification. They are not as useful, however, where confirmation signatures are required or where a verification of exception is required. Increasingly, though, EDI capability, particularly, is considered "table stakes" in the transportation and logistics field.

---

### **Challenges/Opportunities**

As we have outlined in this white paper, the opportunities for using modern digital technologies to better capture and store transportation- and logistics-related data are significant. Data capture remains an issue (with 20% of data not stored) along with rampant data accuracy problems. Companies that understand both the accuracy level of their data and its importance to cost and service levels are increasingly using automated data capture techniques or are requiring that capability of their logistics partners.

While we find the level of automated data capture to be higher in transportation than either manufacturing or retail, our survey respondents clearly indicated significant progress could still be made.

Why is it, then, that paper forms persist?

It is the view of Manufacturing Insights that although the outsourced nature of transportation and logistics lends itself to the use of advanced communications and data capture devices, the "long tail" of third-party logistics providers creates a significant technology vacuum as one gets to smaller providers. This problem exacerbates when we consider the extensive use of low-cost regional sourcing and the often technologically poor nature of third-party logistics providers in many emerging countries.

It has long been our view that "you get what you pay for," and a little extra investment in third-party logistics providers with improved technological capabilities can pay off in the long run.

There is also the elusive nature of ROI to consider when talking about data accuracy. Most manufacturers that have implemented data governance and data accuracy initiatives have done so with the support of a visionary senior manager who is willing to invest resources "on faith." Because data accuracy is fundamental to the operation of any business, it is often difficult to add up savings and generate an ROI.

This is gradually changing as manufacturers increasingly look to service as a way to drive revenue. In the context of service performance, data accuracy benefits are somewhat easier to quantify.

## **ESSENTIAL GUIDANCE**

The fundamental challenge of data capture and accuracy ultimately falls to adequate governance and appropriate scrutiny. It is also about framing the selection of facilitating technology — cost/benefit analysis balancing labor cost, technology cost, and data inaccuracy cost. Particularly in the current economic times, ROI is critical and investments "on faith" are much harder to justify.

It is something of an old saw, but looking at the data capture and input problem through the lens of people-process-technology can be very helpful because all three components are required for best-in-class transportation and logistics performance:

- **People: Implement data capture education initiatives to increase understanding among personnel.** Interestingly, most logistics personnel at the execution level we talk to have very little appreciation for the value of accurate data and even less understanding of the negative business impact on service and profitability. Best-in-class companies have embedded a "data culture" typically by implementing information acquisition improvement initiatives.

- **Process: Identify logistics business processes ripe for transformation.** Certainly, the relatively long history of transportation and logistics outsourcing has resulted in an inevitable adoption of automated data capture and communications technologies — more so, as we previously observed, than in either manufacturing or retail. Yet, material usage of paper forms and manual data input persists. We do not suggest that best-in-class companies have fully eliminated paper forms, but they have implemented a broad strategic review across all logistics business processes to transform data capture in critical areas.

**Technology: Evaluate appropriate tools based on role and need.** Once a business has decided where to focus and with whom, the tactic becomes one of mitigation. Is a technological solution appropriate, or can the problem be more economically solved by applying labor? We see best-in-class companies taking a multifaceted approach based on role and need — in other words, evaluating the specific problem and using the best technological "tool in the toolbox" to solve the problem. We have outlined the various technological tools available to transportation and logistics organizations — the choice will depend on the specific business dynamics and challenges — but the solution in most situations is likely to be a mix of technologies.

Lastly, it is also critical for transportation and logistics organizations to understand how inaccurate their data may be. Experience has taught us that the situation is almost certainly far worse than the business may think; therefore, the potential improvements have equally been underestimated.

---

### **Copyright Notice**

Copyright 2009 Manufacturing Insights, an IDC company. Reproduction without written permission is completely forbidden. External Publication of Manufacturing Insights Information and Data: Any Manufacturing Insights information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate Manufacturing Insights Vice President. A draft of the proposed document should accompany any such request. Manufacturing Insights reserves the right to deny approval of external usage for any reason.