



**RFID Wizards Inc.**

*Implementing RFID Solutions  
Magically*

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# Return on Investment Study for RFID Solution

## Background

This study will show the Return on Investment (ROI) for an RFID solution between two related companies. Company A is a manufacturing firm. They manufacture widgets, and ship them to store distribution centers. Company B is one of the store distribution centers that receives widgets from Company A, and ships them to store locations around the country.

Company A supplies many different types of widgets to Company B, each with a different product number. Company B uses a different IT System and a different set of product numbers than Company A. Currently, when the pallets arrive, Company B must manually translate the product numbers before they can be entered into the Company B IT System. The delay in entering the data to the IT system may cause misplaced or inaccurate inventory counts.





## Recommended Objectives and Scope

RFID Wizards Inc. proposes to use RFID technology to help automate the transfer process from the Company A distribution center to the Company B distribution center. The overall objectives of this engagement are to:

- Demonstrate how RFID technology may be utilized to improve the efficiency and reduce the cost of transfers between the two distribution centers.
- Introduce RFID technology to both companies in a production system.

In order to minimize impact, reduce risk, and ensure success, the scope of this pilot will be limited to transfers between Company A and Company B. However, the processes, equipment, results, and lessons learned will be applicable to other distribution centers. The proposed processes may be performed in parallel with current processes. This will allow for verification of accuracy in the new process and provides a "safety net" in the event of an unforeseen obstacle(s).



## Overview of Proposed Solution

RFID Wizards Inc. will utilize Company A's existing transfer order worksheet and create an electronic version on a handheld RFID reader with barcode scanner. This will replace, or complement, the current paper worksheet and clipboard. For this project, two handheld devices are provided per distribution center. A warehouse worker equipped with this device can pick all of the items in a transfer order.



By following the instructions on the screen, the warehouse worker starts the process by obtaining an empty pallet. An RFID tag is adhered to the pallet. (See image left.) The RFID tag provides a unique identification code for each pallet. The handheld is used to associate the pallet tag with the order. As each item on the order is picked, its UPC code is scanned, and the item is associated with the pallet. Use of the existing UPC barcode improves picking accuracy and helps to maintain count. This process is repeated for all items and multiple pallets until the order is fulfilled. When the order is filled, the handheld is returned to the inventory control clerk and the data is synchronized. A complete order worksheet and one skid manifest per pallet is printed.

Two dock doors per distribution center will be outfit with RFID equipment. The equipment is to be housed in a rugged, fiberglass dock door mount and bolted to the floor. (See right.)

One RFID reader aggregation server, powered by Graviti software, will be installed in each distribution center. Graviti will collect the data from the handheld readers and from the RFID enabled dock doors.



Mount with plastic cover (normal)



Mount without plastic cover (service)

When an order is shipped, the RFID enabled dock doors will detect the pallet tag as it comes through the dock door to be loaded onto a truck. The Graviti server can determine the order number being shipped since all pallets associated with an order have a unique serial number. The server software will store the date/time the order is shipped and verify all pallets associated with an order have been loaded onto a truck. It will also notify the receiving distribution center that the order has been shipped and to expect arrival.



Upon arrival to the receiving distribution center, the Graviti server will automatically generate a worksheet for the order. Most importantly, the worksheet will provide all item information that corresponds to the receiving locations IT system, automatically performing the translation of product numbers.

## Process Details

Incorporating RFID technology will affect the following processes:

- Generate Transfer Order
- Pick Transfer Order
- Create Skid Manifest
- Ship Transfer Order
- Receive Transfer Order
- Check in Transfer Order

It will also add two new processes:

- RFID Tag Inventory Management
- RFID System support

The table below lists all actors & equipment. Hours of operation do not apply to this process.

<b>Cost</b>					
<b>Actor:</b>		<b>\$0.3033</b>			
<b>Avg. Cost:</b>	\$18.20		per hour (\$14.00 + 30% Overhead)		
	\$0.3033		per minute		
<b>Actor/Equipment</b>	<b>Unit of time measurement</b>	<b>Cost per time unit</b>	<b>Hours of Operation</b>	<b>Effectuated by new process</b>	<b>Would require Retraining</b>
Warehouse Worker	Minute	\$0.3033	N/A	Yes	Yes
Inventory Control Clerk	Minute	\$0.3033			
Reader Aggregator	Second	\$0.0000	N/A	N/A	N/A
Dock Door RFID reader	Second	\$0.0000	N/A	N/A	N/A
RFID handheld	Second	\$0.0000			

### *Changes to Generate Transfer Order*

Instead of, or in addition to, printing a worksheet for a transfer order, the inventory control clerk will synchronize an RFID handheld unit with the order information. Like the worksheet, the handheld is assigned to a specific warehouse worker for picking.

Estimated time variance in process: 0 minutes.



### Changes to Pick Transfer Order

The picking process using RFID technology is as follows:

Operation #	m/a	Actor/Equipment	Asset being acted upon	Quantity	Action performed
<b>Pick Order Process</b>					
POP01	a	Inventory Control Clerk	RFID handheld	1	Synchronizes handheld
POP02	m	Inventory Control Clerk	RFID handheld	1	Give handheld and several RFID tags to assigned warehouse worker
POP03	m	Warehouse Worker	Forklift / Mobile Pallet Jack	1	Obtain equipment
POP04	m	Inventory Control Clerk	RFID handheld	1	Login into handheld device to display order to be fulfilled
POP05	a	RFID handheld	Data	1	Handheld stores exact time order process began
POP06	m	Warehouse Worker	Palette	N	Obtain empty pallet
POP07	m	Warehouse Worker	RFID tag	N	Affix RFID tag on Pallet
POP08	m	Warehouse Worker	RFID tag	N	Use hand-held RFID Reader to scan pallet tag
POP09	a	RFID handheld	Data	N	Handheld stores exact time pallet loading began
POP10	m	Warehouse Worker	Product	N	Locate item to be pulled
POP11	m	Warehouse Worker	RFID handheld / Product	N	Scan UPC barcode of item
POP12	a	RFID handheld	Data	N	Verify correct UPC number to be pulled, update quantity
POP13	m	Warehouse Worker	Product	N	Pull quantity of item required, place on pallet
POP14	m	Warehouse Worker	Palette	N	If pallet is full, place in hold and return to step POP06
POP15	m	Warehouse Worker	RFID handheld	1	Return handheld to Inventory control clerk
POP16	a	Inventory Control Clerk	RFID handheld	1	Synchronizes handheld
POP17	a	Inventory Control Clerk	Worksheet	1	Prints worksheet as if warehouse work performed process manually
<b>EOP</b>					

In this process, 'quantity N' refers to the number of pallets required to store all items for a transfer order and the number of items in the order.

Once a warehouse worker becomes proficient using the handheld RFID reader and barcode scanner, the order fulfillment process should take less time than the current clipboard check-off method. Since no benchmarks have been performed to determine what the actual difference will be, the estimated time variance in process: 0 minutes.

### Changes to Create Skid Manifest

Once the handheld has been synchronized, a skid manifest is automatically generated for each pallet. This process is currently performed manually when a pallet is filled.

Estimated time variance in process: reduction of approximately 10 minutes per pallet.

### Changes to Ship Transfer Order

When an order is shipped, the RFID enabled dock doors will detect the pallet tag as it comes through the dock door to be loaded onto a truck. No manual steps are required.

Estimated time variance in process: 0 minutes.

### Changes to Receive Transfer Order

When an order is received, the RFID enabled dock doors will detect the pallet tag as it comes through the dock door and unloaded from a truck. No manual steps are required. The Graviti server will automatically generate a worksheet for the order. The worksheet will provide all item information that corresponds to the receiving locations IT system.

Estimated time variance in process: reduction of approximately 5 minutes per pallet.

### Changes to Check in Transfer Order

Currently, the inventory control clerk must look-up all items on a pallet in the corresponding distribution centers system and translate the item information. This process will now be performed automatically upon order arrival.

Estimated time variance in process: reduction of approximately 20 minutes per pallet.



### *New Process for RFID Tag Inventory Management*

A new requirement exists to maintain an inventory control of RFID tags to ensure an adequate supply is available. In order to streamline this process, the Graviti server will store a count of the RFID tags. An electronic notification is generated to the Distribution Manager and RFID Wizards Inc. when the number of tags in stock falls below an acceptable minimum. A re-order can then be placed. When new tags are received or any change in the number of tags occurs, the current inventory tag count will be updated automatically.

### New Processes for RFID System Support

Company A and Company B staff will be trained in all process changes as well as the use and maintenance of the RFID equipment and systems. For example, the Graviti software requires regular updates of inventory information and their link to existing IT Systems.

Estimated time variance for new processes: addition of approximately 5 minutes per pallet.

The total estimated time variance for all processes yields a **reduction of approximately 30 minutes per pallet**. Based on the average cost per minute of a warehouse worker and inventory control clerk, **this produces a savings of \$9.10 per pallet**.



# Projected Time to Valuation

To determine the Projected Time to Valuation, the following assumptions were made:

- An average employee cost of \$18.20 per hour (\$14.00 + 30% overhead).
- Approximately 30 minutes per pallet will be saved in manual process time.
- Equipment is depreciated using a straight-line method over 36 months with \$0 recovery value.

Four scenarios are calculated. The current average number of pallets per month is 500. If this remains constant, return on investment is achieved within 36 months after implementation. Time to valuation is earlier if more than 500 pallets per month and transferred between the facilities.

The spreadsheet right shows a detailed breakdown for time to valuation:

Description	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
	Year 1																
	Year 2				Year 3				Year 4								
<b>Scenario</b>																	
<b>100 Pallets per month</b>																	
Installation and Integration Services	\$90,000																
Cost for RFID tags - 3 months	\$255.00																
RFID Equipment	\$59,055.20																
Pallet Processing savings		\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255	\$255
RFID Equipment (S/LN 36 months w/80% recover)		(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)	(\$2,730.00)
RFID Equipment (S/LN 36 months w/80% recover)		(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)
Project Expense	\$149,310	\$141,914	\$134,518	\$127,121	\$119,725	\$112,329	\$104,933	\$97,536	\$90,140	\$82,744	\$75,348	\$67,951	\$60,555	\$53,159	\$45,763	\$38,367	\$30,971
<b>250 Pallets per month</b>																	
Installation and Integration Services	\$90,000																
Cost for RFID tags - 3 months	\$637.50																
RFID Equipment	\$638																
Pallet Processing savings		\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638	\$638
RFID Equipment (S/LN 36 months w/80% recover)		(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)	(\$6,825.00)
RFID Equipment (S/LN 36 months w/80% recover)		(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)
Project Expense	\$149,893	\$138,584	\$127,275	\$115,966	\$104,657	\$93,348	\$82,039	\$70,730	\$59,421	\$48,112	\$36,803	\$25,494	\$14,185	\$2,876	(\$1,433)	(\$2,876)	(\$5,372)
<b>500 Pallets per month</b>																	
Installation and Integration Services	\$90,000																
Cost for RFID tags - 3 months	\$1,275.00																
RFID Equipment	\$59,055.20																
Pallet Processing savings		\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275	\$1,275
RFID Equipment (S/LN 36 months w/80% recover)		(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)	(\$13,650.00)
RFID Equipment (S/LN 36 months w/80% recover)		(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)
Project Expense	\$150,330	\$133,034	\$115,738	\$98,441	\$81,145	\$63,849	\$46,553	\$29,256	\$11,960	(\$5,336)	(\$22,632)	(\$39,929)	(\$57,225)	(\$74,521)	(\$91,817)	(\$109,113)	(\$126,409)
<b>1000 Pallets per month</b>																	
Installation and Integration Services	\$90,000																
Cost for RFID tags - 3 months	\$2,550.00																
RFID Equipment	\$59,055.20																
Pallet Processing savings		\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550	\$2,550
RFID Equipment (S/LN 36 months w/80% recover)		(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)	(\$27,300.00)
RFID Equipment (S/LN 36 months w/80% recover)		(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)	(\$4,921)
Project Expense	\$151,605	\$121,934	\$92,263	\$62,591	\$32,920	\$3,249	(\$26,422)	(\$56,094)	(\$85,765)	(\$115,436)	(\$145,107)	(\$174,779)	(\$204,450)	(\$234,121)	(\$263,792)	(\$293,463)	(\$323,134)



## Risk/Benefits Analysis

### Risks:

#### RFID Tag Misreads

There are times due to antenna orientation, interference, damaged tags, or other circumstances that an RFID tag may not be read. This could result in inventory quantity errors and additional time to correct the errors. Visual verification tasks when loading a pallet on a truck should be performed to reduce the likelihood of such errors.

#### Not Using RFID Enabled Dock Door for Transfers

All transfers between the two facilities must utilize RFID enabled dock doors. If a tagged pallet is loaded, or unloaded, through a standard dock door, there is no way for the system to be aware of it. This could result in inventory quantity errors and additional time to correct the errors.

#### Incorrect Association of Items between IT Systems

If an item number in Company A's IT System is improperly associated with an item in Company B's IT System, then a manual lookup will need to be performed to retrieve the correct information. This would result in time lost or possible inventory error.

### Benefits:

- Reduced labor hours to process transfers
- Reduced keyboard entry errors
- Notification an order has been shipped when it leaves the dock door
- Verify all pallets in a shipment have been shipped

It should be noted that only the direct saving from labor hours is included in the time to valuation calculation.

#### Additional Statistics

Since the date/time is captured when a pallet is setup, loaded, and complete, the Distribution Manager will have valuable statistics that were not available before. These statistics include:

- Holding time – actual time from pallet loaded until time loaded on a truck
- Actual amount of time it takes to load a pallet
- Specific employee performance

#### Future Applications

It is also possible to use the RFID equipment for future applications such as customer logistics.



## Cost for Services and Equipment

Equipment	Cost	Qty	Total
RFID Enabled Dock Door	\$8,500.00	4	\$34,000.00
RFID Aggregation Server (Graviti)	\$3,000.00	2	\$6,000.00
Handheld RFID/barcode reader	\$2,199.00	4	\$8,796.00
Misc. Hardware & cables	\$500.00	1	\$500.00
2 Year Extended Warranty on all equipment	\$9,759.20	1	\$9,759.20
			<b>\$59,055.20</b>
<b>Consulting Services</b>			
RFID Engineer (person days)	\$1,200.00	75	\$90,000.00
			<b>\$90,000.00</b>
<b>Total Equipment &amp; Services</b>			<b>\$149,055.20</b>
RFID tags	\$0.85	1,000	\$850.00

*\*Note: Additional discounts will be applied for larger quantities. Costs for equipment and tags do not include charges for customer-selected method of shipping and handling. RFID Wizards Inc. uses USPS, UPS, or Federal Express.*

### Additional and Optional RFID Equipment

Company A or Company B may also purchase Additional RFID equipment. This equipment includes additional RFID enabled Dock Doors; and/or RFID hand scanner/bar code readers.



## About RFID Wizards Inc.

### What We Do

RFID Wizards Inc. provides professional consulting services in the following areas:

- Calculate Return on Investment: Evaluate RFID technology to determine if it will produce an ROI in 12-18 months
- Business Process Modeling: How exactly will RFID technology impact your business?
- Independently evaluate RFID technology based on our customer's requirements
- Installation and configuration of RFID equipment
- Integration of RFID equipment with back-end systems (detailed list below)
- Training: Using RFID Technology in Your Business

### Research and Development and Custom RFID Solutions

RFID Wizards Inc. R&D team can work with you to design, develop, & build a proof of concept. Our engineers have designed custom RFID tags and antennas. We can manufacture RFID tags to specification including labels, cards, badges, and plastic injection molded forms. Our antenna design team can construct antennas to fit unusual areas.

### Who We Work With

- Commercial (wholesale & retail)
- Industrial
- Manufacturing
- Healthcare
- Legal
- Logistics and Transportation
- Government Agencies (we offer services on GSA Schedule)

### Where We Work

RFID Wizards' consultants have developed solutions for customers throughout North America and Europe. We have experience implementing products that operate internationally.

### RFID Wizards Inc. Corporate Information

RFID Wizards Inc. is a Maryland S Corporation specializing in the design and implementation of RFID systems. RFID Wizards Inc. corporate headquarters is located just 45 minutes north of Washington D.C. Our west coast location is located in Silicon Valley between San Francisco and San Jose, California. We work with companies throughout the globe.

#### Corporate & East Coast

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## Experience with RFID Technology

RFID Wizards Inc. staff is experienced working with equipment from numerous manufacturers including:

- Alien Technology
- Feig Electronic
- AARFID
- Samsys
- Matrics
- Diester Electronic
- AWID
- Axxess Technologies
- Intermec
- Texas Instruments
- NordicID
- ThingMagic

## Information Technology Skills

RFID Wizards Inc. has staff that can integrate RFID technology with the following:

Relational Databases:

- Oracle, MS SQL Server, Sybase SQL Server, IBM DB2
- mySql, PostgreSQL /Redhat
- MS Access, Foxbase

Object Oriented Database:

- Lotus Notes and Domino

ERP / SCM / WMS:

- SAP
- Oracle ERP
- Advanced Logic Systems
- CoreWMS

Programming Languages & Environments

- C/C++, Assembly (8x86,68K,6809,z80,6502),
- XML, Java, JavaScript, HTML, PHP, Perl, PGP
- Microsoft Visual Basic, MS.NET/ActiveX, ASP
- Lotus Script, Notes API, Lisp, Natural Adabase.

Platforms:

- Windows XP/2000/NT/9x
- Linux and \*nix

Other:

- Numerous Warehouse management systems
- 3D Programming experience in various modeling scenarios.

