Intelligrated “Wows” Zappos.com with New Automated Order Fulfillment Center

High-speed material handling system helps Internet shoe and apparel retailer offer customers fast shipping and a superior online shopping experience

Please note: Intelligrated acquired the North and South American operations of FKI Logistex® in June 2009.

Nick Swinmurn was walking around a mall in San Francisco in 1999, looking for a pair of shoes. After an hour going from store to store, he finally went home empty-handed and frustrated.

Eight years and more than a billion dollars in sales later, Swinmurn’s online retailer Zappos.com (www.zappos.com) boasts the largest selection of shoes anywhere — online or offline. And Zappos is not stopping there. The self-proclaimed “service company that just happens to sell shoes” has expanded to bags, apparel, and accessories, and has plans to eventually sell “anything and everything.”

Zappos operates on the principle that if you focus on providing a great shopping experience instead of maximizing profits, sales growth will follow. And it’s paying off, with the Sequoia Capital-supported company recording $597 million in gross merchandise sales in 2006.

The company’s “wow” philosophy of service and selection includes 365-day free returns, 24/7 customer service, 110% price protection, and unheard-of free overnight shipping on every order. The Zappos shopping experience also features extensive website search options, clear views of every product from every angle, and “live” inventory where nothing is ever out of stock. And they don’t skimp on selection either, with over 1,000 brands and almost 3 million products available to ship immediately.

“The ‘wow’ factor is very important to us and to the success of our business,” says Craig Adkins, vice president of fulfillment operations for Zappos. “We are not competing with other Internet companies; we are competing with the store experience. Offering the best service and selection while getting our goods to the consumer as quickly as possible is the only way to compete in this market.”

But getting an order processed, packaged, shipped, and onto your doorstep in less than 24 hours is not an easy task. It takes the right people, careful planning, and a fast, optimized order fulfillment system like the one material handling integrator Intelligrated® (formerly FKI Logistex®) and London-based design and business consulting firm Arup® (www.arup.com) provided for the Zappos facility in Shepherdsville, Kentucky.

Zappos Brings in Experience to Help Automate Fulfillment Operations

In the summer of 2005, exploding sales on Zappos.com were pushing the limits of the company’s outdated, largely manual order fulfillment center. Zappos
management knew that they had outgrown simple conveyors and paper pick lists, and leased an 800,000 square-foot building across the street to house a brand-new automated fulfillment system and serve as the company’s primary warehouse and distribution facility.

The proposed facility promised Zappos increased throughput to handle larger shipment volumes and reduced order cycle times to get orders to customers faster than ever before. To get the project off the ground, Zappos formed the Warehouse Automation Team, made up of senior leadership in the company. But with only one distribution center and little experience in automation, the team needed someone with a few large-scale material handling projects under their belt to bring a new attitude and perspective to their fulfillment operations team.

Enter Craig Adkins, a technologist whose impressive resume includes 20 years in the military, Total Quality Management (TQM) training at the world-renowned W. Edwards Deming Institute, and process improvement for one of the most successful direct-to-customer online retailers in the world.

Adkins says the automated fulfillment center was a paradigm shift for Zappos. “When I first came to Zappos, the concept of ‘flow’ was difficult for people to grasp,” he says. “It was still a very manual environment, with workers still picking from paper lists and very little automation.”

However, that was all about to change. In a year the new system would be up and running for the 2006/2007 holiday season, shipping out twice as many packages as the old building ever had and achieving the lowest order cycle times in Zappos history.

Zappos Teams Up with Arup to Design a Customized System

With an empty 800,000-square-foot building and a blank sheet of paper, Zappos turned to the Arup logistics team in New York to create a design concept for the new fulfillment system. Although Adkins was initially skeptical about hiring an engineering consultant, he was pleasantly surprised with the way Arup worked with Zappos to develop a customized system.

“Our goal was to make the design process interactive to create a concept specific to Zappos’ needs,” says Charlotte Dangerfield, Arup’s senior logistics consultant. “We held workshops and worked closely with the whole team to give Zappos the ability to enhance the service features that they built their business on.”

“Direct-to-customer fulfillment takes a very different mindset than retail distribution,” says Adkins. “Every single package goes directly to a customer, requiring simultaneous levels of speed and quality control.” Also, nothing can be warehoused for long because shoe inventory goes stale very quickly and often consists of seasonal and limited runs, especially for designer brands.

The final design that the Zappos and Arup team agreed on encompasses 416,000 square feet of the building and includes unconnected but overlapping receiving and shipping systems, a dedicated returns system, a static-racking system that stores each SKU in

Ready-to-ship packages are sorted by an Intelligrated high-speed sliding shoe sortation system.
a pickable location, and a built-in photo lab to shoot new products as they are received.

To really “wow” Zappos customers, they needed to get things moving with a faster material handling system. And as the project was put up for bid with the 2006/2007 holiday season fast approaching, the Zappos Warehouse Automation Team knew that it was already crunch time.

Rapid Order Cycle Time Makes Free Next-Day Shipping Possible

In February 2006, Arup contracted Intelligrated to integrate and install the equipment to automate all of the fulfillment system’s material handling. Intelligrated sales account manager David Campbell worked with the Zappos team and Dangerfield to specify Intelligrated high-speed sliding shoe sortation systems and reconfigure conveyors to increase speed and optimize automation for receiving, presort, put-away, picking, packing and shipping.

Zappos believes that the speed at which a customer receives an online purchase plays an important role in whether they will shop online again. Zappos made rapid order cycle time the highest priority, requiring Campbell and his team to design the system with the ability to process an order in under an hour.

When Adkins reviewed a standard design for the static-racking conveyor system, he asked a question: “How much time will it take for a package to be conveyed from the furthest point on the conveyor to the packing area?” The answer was around 35 minutes.

This was not good enough.

“To keep our promise to our customers, we need the ability to process an order in one hour or less under duress,” says Adkins. “We could not be spending 35 minutes on conveyor travel alone.”

Campbell and his team worked with Zappos to design a customized conveyor system that cut travel time by a half hour, down to only five minutes. This and other system configurations made by Intelligrated brought the average fulfillment cycle time down to five hours, with the capability to process an order in under an hour that Adkins requested. “We could not do this without the material handling system provided to us by Intelligrated,” says Adkins.

With the fast and efficient Intelligrated system, Zappos feels confident to offer free overnight shipping on all orders, with the promise that any order received by 4 p.m. EST and shipped UPS or FedEx to the 48 contiguous United States will be on the customer’s doorstep the following day. The new system has also enabled Zappos to create an unpublished internal deadline, ensuring all orders received by 8 p.m. are on the truck for next-day shipping.

Adkins recalls that on a recent night, 70% of all orders received between 11 p.m. and midnight made it to customers the very next day, and the average cycle time was around 2.25 hours. Meeting customer expectations is one thing, but exceeding them is where the “wow” factor really comes into play.
Live Inventory Offers Zappos Customers a Better Shopping Experience

In addition to free overnight shipping, Zappos.com features inventory that is live to the customer, just like in a brick and mortar store. If someone orders the last pair of shoes in a size or color and it is no longer in stock, it is no longer visible to online shoppers. And the moment a new product, size, or color is put on the shelf, it instantly pops up on the website.

To truly make the inventory “live,” Zappos needed a way to get product photography onto the website instantaneously. And not just any product photography — they needed clear views and zooms that would enable online patrons to examine products as if they were on a store shelf.

Taking advantage of their wide range of engineering disciplines, Arup designed and built a full-service photo lab in the center of the fulfillment center. Intelligrated’s motor driven roller conveyor brings the first of every newly received SKU directly to the photo lab, where photographs are taken from a variety of angles and immediately uploaded to Zappos.com. The photo lab even includes a studio to shoot live models for certain apparel and accessories.

A full-service photo lab in the center of the fulfillment center enables Zappos to upload images of new products onto the website as soon as they are received.

Zappos Requires the Full Portfolio of Intelligrated Equipment

According to Intelligrated senior project manager Dick Anderson, the new Zappos order fulfillment system includes almost every product that Intelligrated manufactures for retail distribution and fulfillment. Working with Intelligrated meant Zappos had access to a single-source material handling manufacturer and systems integrator, making it easier to customize and optimize their system while keeping to the aggressive project timeline.

“I know when someone is trying to up-sell me on technology or equipment that I don’t need, and Intelligrated didn’t do that,” says Adkins. “They even looked for ways to save us money and make things more efficient.”

When SKUs are received, an Intelligrated high-speed sliding shoe sortation system with Accuglide™ powered roller conveyor routes a wide range of small cartons, shoeboxes, purses, and other items to shrink-wrapping lanes. Packages are then redirected to another high-speed sorter for put-away in the racking system.

When a customer places an order online, a Zappos employee picks it from the static racking. A conveyor routes it to another high-speed sliding shoe sorter, which distributes the SKUs to a single or multi-pack area. To create a quieter and safer working environment for its employees, Zappos chose to use Intelligrated’s 24-volt motor driven roller conveyor, which operates at less than 72 dBA.

Completed packages are routed to three Intelligrated print-and-apply modules for automatic labeling. Ready-to-ship packages are sorted by a third high-speed sliding shoe sortation system at over 100 cartons per minute to the appropriate shipping lane and conveyed directly onto the truck.
Intelligrated’s warehouse control software serves as the host and graphic user interface driving the system, and was integrated with Zappos’ existing homegrown warehouse management system (WMS). System monitoring software from Intelligrated alerts Zappos employees of any alarms or jams, as well as provides productivity information on the system.

For low-speed sortation, a series of telescoping boom unloaders and accumulating loaders, as well as five Intelligrated popup wheel sortation systems, are also included. Because the building was under lease and everything had to be floor-supported, Anderson and his team also installed eight mezzanines throughout the facility.

**The Big Test: The Holiday Rush**

In November 2006, as holiday shoppers crowded Zappos.com’s bandwidth, the first orders were shipped from the new fulfillment center. Over the 2006/2007 holiday season, daily shipments hit record levels, peaking at 42,000 units and almost doubling the 23,000 units shipped at the old facility.

But according to Anderson, getting to this point took a lot of hard work. “We were working on a very aggressive schedule to get the system up and running for the holiday season,” says Anderson. “That means everything was double-time, many tasks needed to be done in parallel, and there was no room for error.”

This was especially important in October 2006, when the Zappos and Arup team put the Intelligrated system to the test with extensive confidence trials and sign-offs. Zappos wanted to ensure that the equipment could meet strict uptime requirements before they would use it to start shipping out orders — and it passed with flying colors.

“The Intelligrated equipment sailed through the confidence trials,” recalls Adkins. “We’re running our system 24 hours a day, and we didn’t even come close to the downtime that we allowed for.”

Dangerfield also spent long hours on-site, living in Kentucky for the summer to oversee the installation of the engineering packages. “Intelligrated really stepped up to the plate during the installation phase,” she says. “They even worked after their

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**Zappos Extends “Wow” Factor to its Suppliers**

Zappos firmly believes that the online retailer with the best service will be the one that people buy from. And evidence of their service-oriented company culture is felt by their employees, investors, suppliers, and anyone else who has the pleasure to work with them.

According to David Campbell, the Intelligrated sales account manager involved in the project, Zappos goes the extra mile to reward its suppliers for a job well done. Because of this, Zappos, Arup, and Intelligrated developed a strong partnership that all three companies agree will continue into the future.

Anderson cites this collaborative relationship as the key to meeting the strict deadlines of the project. “This job would not have gotten done without the personalities of Adkins and the rest of the Zappos team,” says Anderson. “They were totally involved, and always available.”

Campbell agrees. “They were one of the best customer and consultants I have ever worked with,” he adds. “They know what they want and they know what we need to make it happen. And it was fun — that’s unusual in this business.”

Although built to handle Zappos’ projected 2007 capacity, Intelligrated designed the material handling system to be easily scalable to 2009 throughput levels. The receiving platform is two-thirds built, the singles pack area is half-built, and there are plenty of pre-built divert points on the high-speed sliding shoe sorters to tie in more lanes.

This was an important feature to Adkins, who says even he was “wowed” by the growth he has seen in his first year at Zappos.
contract was expired to make sure commissioning went well.”

But according to Adkins, the tight project schedule was nothing unusual. “The reality is that every major project that I’ve been involved with over the last 10 years is always a crunch, always a push, and always last-minute,” he says. “Having vendors that can react to that is really important, and Arup and Intelligrated did a great job.”

**New System Enables Zappos to Continue to Increase Efficiency**

“When we moved into the new facility the light went on for many people at Zappos who never worked in a high-volume environment,” says Adkins. “Everyone—managers, supervisors, and other employees—could finally see the concept of flow and how important it is.”

“Constraints mean lost opportunities that you’ll never get back,” he continues. “Now they get it.”

Adkins says the new Intelligrated system is intuitive and easy to train on, and therefore easy to drive efficiencies. Zappos has reduced distribution and labor costs, achieved record-low order cycle times, and more than doubled shipping volumes to stay one step ahead of the company’s astronomical growth.

Working within the Zappos “wow”-power paradigm, Adkins strives to continually improve the Zappos fulfillment process. He measures standard deviation on everything and calculates probability and variability factors, a practice that he instilled in the rest of his team.

“I don’t ever let anyone tell me just the average,” says Adkins. “They have to tell me the average and the standard deviation. As we do that, we can continue to drive out the variation and get as close to the mean as possible.”
Zappos.com Fulfillment Center  
Systems Overview

**Location:**  
Shepherdsville, Kentucky

**Size:**  
416,000 square feet

**Systems Overview:**  
- Accuglide™ photo-eye conveyor  
- Motor driven roller conveyor  
- Right angle transfer conveyor  
- Print-and-apply modules  
- High speed sliding shoe sortation systems  
- Popup wheel sortation systems  
- Sawtooth merges  
- Telescoping boom unloaders and accumulating loaders  
- Mezzanines

**Controls and Software:**  
- Intelligrated warehouse control software  
- Intelligrated system monitoring software

**Conveyor Systems:**  
Intelligrated

**Sortation Systems:**  
Intelligrated

**Static Racking System:**  
SpaceRak

**Photo Lab:**  
Arup
Intelligrated Products and Services

- Systems Integration
- Sortation Systems
- Conveyor Systems
- Palletizing Solutions
- Software & Controls
- Order Fulfillment Systems
- 24x7 Technical Support
- Design & Build

About Intelligrated

Intelligrated is a leading American-owned, single-point provider of automated material handling solutions with operations in the U.S., Canada and Mexico. Headquartered in Cincinnati, Intelligrated designs, manufactures and installs complete material handling automation solutions, including IntelliSort® line sortation systems, Crisplant® tilt-tray and cross-belt sortation systems, conveyor systems, Alvey® palletizers and robotics, Real Time Solutions® order fulfillment systems, warehouse control software and advanced machine controls—all supported by 24x7 Customer Service and Support.

Serving the warehousing, distribution, consumer product manufacturing, postal and parcel markets, Intelligrated collaborates closely with its clients to develop productivity solutions and responds to their needs throughout the life of their material handling systems.

Intelligrated Service & Support

The in-house Customer Service and Support (CSS) program offered by Intelligrated backs all of our products. Services available include:

- IN-24X7® technical support
- Replacement parts logistics
- Field service
- Equipment and system audits
- Upgrades and modifications
- Full service and maintenance contracts
- Preventive maintenance
- Customer training and documentation

CSS is available 24x7 to provide all of the services needed to keep your equipment running at peak efficiency. Whether it’s on-site support or troubleshooting via our hotline, Intelligrated has the most comprehensive customer support program in the industry.

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