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CHEP: The Net of Things

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Abstract:

PART A: Forced by operational inefficiencies in its own business model, CHEP, the market leader in the rental pallet business, became an early adopter of Radio Frequency Identification (RFID) technology. Having proven the effectiveness of the technology for internal operations with a pilot test, CHEP now had to find clients who want to adopt the technology-enabled services in order to pay for a large scale roll out.

The case traces CHEP's challenges associated with the development and deployment RFID in its own operation and raises questions of how to proceed with potential IT-enabled change at the enterprise and supply chain level, without spoiling relationships with current clients and maintaining its core business.

PART B: In fall 2007, Brian Beattie and Puneet Sawhney looked back at CHEP's RFID initiative and the progress that has been made since the 2003 decision to further incorporate the technology into its assets. While the original intent of tagging all pallets did not materialize, considerable progress had been made into quantifying the benefits of RFID adoption. Industry-wide developments had changed the scope of the RFID initiative from simply tagging the asset pool to creating value added service for CHEP's clients. Overall, RFID had yet to revolutionize the supply chain, but the evolution of technology and the innovation of RFID related products and services had aided CHEP in maintaining its market leadership in the pallet business and enabled CHEP to created new lines of business.

Keywords: IT-enabled change, RFID, organizational value chain, technology adoption, IS investment, product and service innovation, asset tracking

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PART A: INTRODUCTION[12]

In the early 2000s the major retail chains moved beyond the boundaries of the enterprise to further improve their operations. One particular focus of companies such as Wal-Mart, Tesco, and Metro was the optimization of the entire supply chain. While Electronic Data Interchange (EDI) had connected supply chains a decade earlier, the quality and accuracy of the information shared was by no means satisfactory. The emergence of Radio Frequency Identification (RFID) provided the technology needed to capture accurate and timely item-level data, information that was deemed crucial to optimize the product and information flow throughout entire supply chain.

CHEP, the leading provider of rental pallets in the U.S. was both an integral part of most major supply chain operations and an early adopter of RFID. Having invested more than $20 million in the research and development of RFID enabled pallets, the CHEP management was under increasing pressure by its parent company to monetize on its innovations beyond efficiency gains in its internal operations.

By championing RFID, CHEP had put itself in the position to enable change on the enterprise, supply change and industry level. However, inducing technology enabled change while at the same time maintaining a profitable core business posed a unique challenge for CHEP. Unsure of how to best market the new technology to clients and partners, CHEP had to decide whether they just want to offer enhanced RFID pallets for its clients, or to become a supply chain wide information broker.

I. INDUSTRY BACKGROUND

A pallet is a platform, usually made of wood and assembled with metal nails. Typically, goods move in commerce from their manufacturer to distributors, to wholesalers, and finally to retailers, where they are made available for purchase by the consumer. Wooden pallets are used for purposes of hauling, loading and unloading, and storing the goods. The wooden pallet has traditionally been the basis for the design of storage racks, warehouse storage areas, forklifts, docks and containers used in shipping goods. It is estimated by industry sources that on average there are more than seven pallets for each person in the United States. According to a survey conducted by the National Wooden Pallet and Container Association, 91 percent of pallet users reported using wood pallets, with the remainder being made from other materials such as steel, plastic, or cardboard [Maloney 2000].

By 2003, the U.S. pallet industry generated revenues of approximately $6 billion, and it was served by approximately 3,600 companies, most of which were small, privately held entities. These companies were generally operating in only one location and serving customers within a limited geographic region. The industry was generally composed of companies that manufacture new pallets and companies that repair and recycle pallets. The U.S. Forest Service estimated that 475 million new wood pallets are produced annually, 300 million wood pallets were repaired and sent back into circulation, and 175 million wood pallets were sent to landfills [Bush and Araman 1998].

The pallet industry, a generally mature industry, had experienced significant changes during the 1990s. These changes were due, among other factors, to the focus by Fortune 1000 businesses on improving the efficiency of their supply chains, manufacturing, and distribution systems. This focus had caused many of these businesses to significantly the number of vendors serving them to simplify their procurement and product distribution processes. Palletized freight facilitated movement through the supply chain reduced costly loading and unloading delays at distribution centers. As a result, there had been an increased demand for high-quality pallets which decreased the cost per trip by reducing product damage during shipment and storage and by increasing the number of trips for which pallets can be used. Moreover, environmental and cost concerns had also accelerated the trend toward increased reuse or "recycling" of pallets and certain other transport packing materials, further emphasizing the importance of the quality of newly manufactured pallets.

[1] The authors have prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. It is not intended that statements herein be excerpted as fact outside of the class discussion.

[2] For access to the teaching note please email Sascha Vitzthum at sascha_vitzthum@bus.emory.edu

Shipping companies had a variety of options for procuring pallets. Traditionally, companies would buy the pallets, load the goods, and send them to their clients. Depending upon the size and make-up of the operations, businesses would decide whether to opt for single-use, lower-quality pallets that are not returned by the customers or for higher quality, reusable pallets, where the return processes would need to be arranged with the customers. The administrative, operational and logistical costs associated with managing the pallets, led to the emergence of third-party providers that started to lease out high-quality pallets and offer management of the associated logistics. In the outsourced rental model, shippers paid a combination usage and transfer fees that usually amounted to total trip costs ($5-$8) that are below the purchase price of a one-way pallet ($10).

By 2003, more than 10 percent of the 2 billion pallets that were in circulation in the U.S. were provided by pallet leasing or pooling companies. While the asset share in the overall market was fairly small, the pooling and leasing of the pallets was a highly profitable business. The major pallets pooling providers generated close to $2 billion in annual revenue and were expected to grow both their market share and revenue in the future.

II. COMPETETIVE LANDSCAPE

In the U.S., pallet pooling was a fairly novel business model with few national providers and some regional providers. By 2003, approximately 200 million pallets in circulation were multi-use rental pallets. In 1990 CHEP entered the U.S. market as the first provider with a national distribution network in the U.S. Throughout the consolidation of the pallet industry in the 1990s a number of companies entered and exited the pallet pooling business. Between 1990 and 1996 companies such as First National Rental, Pallet Pallet and the Canadian Pallet council tried unsuccessfully to establish a pallet rental program in the U.S. The most common issue for the companies was the fairly small size of their pallet pool as well as low distribution center density, which increased the cost of shipping pallets. In 1997, PECO, a consortium of 12 pallet companies, was the first company to develop a rental system that could compete with CHEP's. Focusing on the grocery industry, PECO management decided to work with only a few clients and a competitively small pallet pool of 2 million. The strategy worked, and by 1999 PECO became the second largest rental provider in the U.S. Besides the two market leaders, only regional companies such as Kamps Pallets in Michigan were able to make the pallet pooling model work. Moreover, there were several attempts to introduce plastic pallet pooling models as a more environmentally friendly alternative to wooden pallets. However, the higher manufacturing costs and the resistance of industry organizations to adopt plastic pallets as a standard led to a quick demise of those efforts.

By 2003, CHEP was the undisputed market leader in the U.S., at situation which mirrored the developments of most of the countries where CHEP operated in. Being the pioneer of the pallet pool-leasing model, CHEP was the market share leader in 90 percent of the 42 countries that it operated in.

III. COMPANY BACKGROUND

The Commonwealth Handling Equipment Pool (CHEP) evolved from the Allied Materials Handling Standing Committee, an organization developed by the Australian government to provide efficient handling of defense supplies during World War II. In 1949, the government decided to privatize the industry and mandated the sale of the CHEP organization. Among CHEP's core assets were vast amounts of pallets, forklifts, and cranes left by the allied forces.

Brambles, a company created in 1875, had significant experience in the materials handling industry, acquired CHEP in 1958. The acquisition of CHEP empowered Brambles with new core competencies making it ready to meet the constantly growing demands of the materials-handling industry. In particular, Brambles was interested in exploiting the large pool of pallets and containers, and taking advantage of the scale that this pool of platforms provided. Within a few years CHEP, leased out and operated the largest pool of pallets and containers in the southern hemisphere and the largest hiring fleet of forklift trucks in Australia. With the acquisition of the British firm GKN, CHEP set up a UK branch in 1974, followed by CHEP Canada in 1980, and CHEP USA in 1990.

By 2003, CHEP was the global leader in pallet and plastic container pooling services, supporting many of the world's largest companies. With its global headquarters located in Orlando, Florida, CHEP employed more than 7,500 employees in 42 countries at more than 500 service centers. On a global scale, the company generated approximately $US 3 billion in revenue by pooling more than 200 million pallets and more than 40 million containers worldwide. In 2003, CHEP served more than 75,000 consumer good manufacturers and produce growers (manufacturers) and 225,000 wholesalers and retailers (distributors).

IV. BUSINESS MODEL

By issuing, collecting, conditioning, and reissuing pallets and containers from its service centers, CHEP supported manufacturers and growers to transport their products to distributors and retailers. Drawing from a pool of over 100

million pallets and containers, CHEP was only one of two pooling companies that distributed and collected its pallets across the entire U.S. Pallets accounted for nearly 90 percent of CHEP's pooling business.

CHEP leased high quality, standardized and easily identifiable (all CHEP pallets are painted blue) 48" by 40" pallets. The pallets were designed for multiple uses. Deploying high-quality softwood and reinforcing design, the pallets weighed 60 lbs. and could hold up to 2,800 lbs. of goods. In comparison, a standard pallet was 15 lbs. lighter and could only carry up to 1500 lbs. With an average of $20 of procurement cost, the CHEP pallets were also twice as expensive as the regular single-use pallets. By using CHEP's pallets, clients had reduced transportation costs and reduced product damage due to more stable storage arrangements which would prevent weight shifts of the loaded goods. Moreover, softwood pallets were less likely to break when mishandled during transportation, loading and unloading. With higher payloads per pallet, transporters could improve vehicle utilization and provide faster turnaround times. Moreover, through the standardized design of the pallets, products could be unloaded faster and safer. In addition, the reusability of the CHEP pallets reduced disposal expenses at land fills.

CHEP's asset flow model was designed for closed-loop systems, where all supply-chain links are in a contractual relationship with CHEP. Initially, pallets were issued to manufacturers that could subsequently load goods onto the pallets. During this step, CHEP would charge the manufacturer an issue fee, which was related to the transport of the pallets from CHEP's service centers to the manufacturer's location, and a hire fee based on the days that the pallets were in the manufacturer's possession. When the loaded pallets were shipped to the distributors, CHEP charged a transfer fee to the distributors. The distributors then had to pay a daily hire fee while they used the pallets and a recollection fee upon returning the pallets. Ideally, CHEP would collect all fees from the parties involved and receive all of its pallets at the service center, where pallets were sorted (A), refurbished if necessary (B), and reissued (C).[3]

On average, a pallet trip through the closed loop took 44 days. It was estimated that CHEP charges a total of $5 to $6 in fees per pallet for an average trip.[4] Since it charged a variety of variable and fixed fees from different clients, CHEP had tremendous administrative cost associated with billing the correct amount to each partner. Moreover, CHEP heavily depended on inventory reports by the clients (which are seldom verified) and random sampling to assess the correct fees.

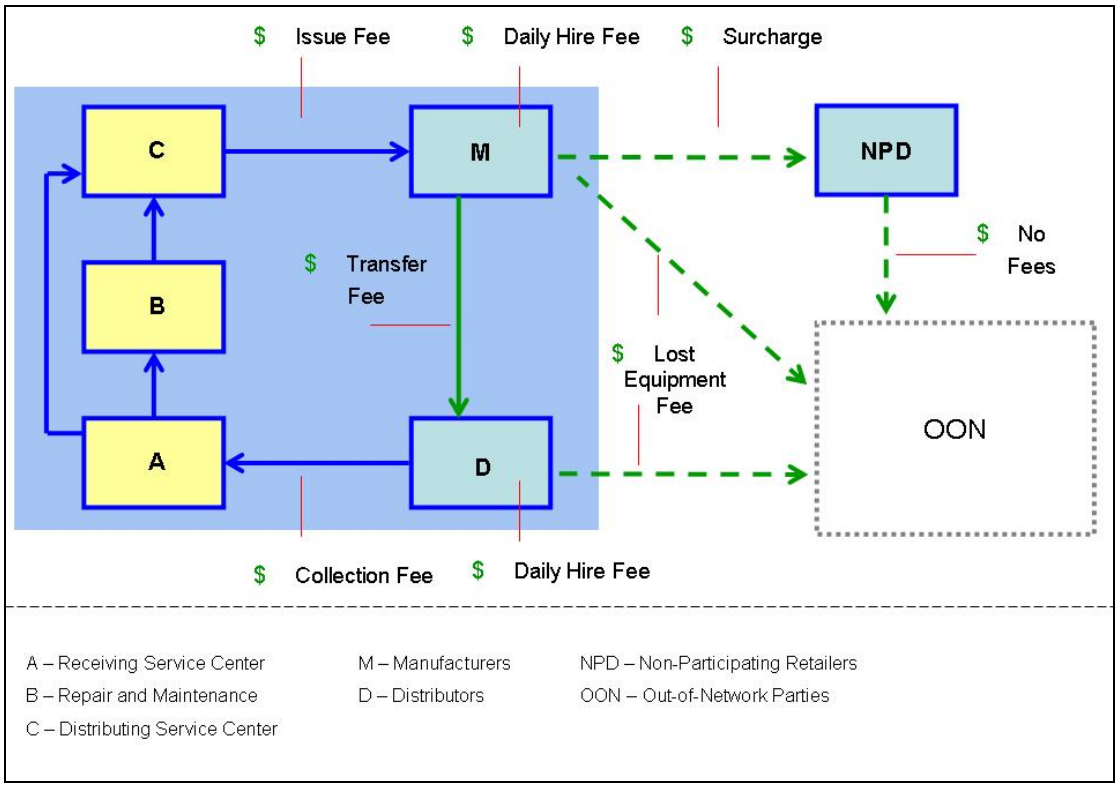

Figure 1. Asset Flow and Pricing Model

[3] The closed-loop asset flow is depicted in the shaded area of Figure 1.
[4] The financial data in this section were derived from public records and interviews with CHEP management.

In the original closed-loop model, CHEP had contract relations will all participating parties. In the past, CHEP had a fairly good record of tracking the pallets and billing the clients. However, with the rise of contracts and the growth in scale, pallets frequently were shipped outside of the network, making it impossible for CHEP to track pallets and enforce their return to the service centers. CHEP introduced several charges and penalties for its clients to limit pallets moving outside the closed-loop system. In 1998, it introduced surcharges ranging between $3.50 and $8.00 for preferred manufacturers that would ship pallets to so called Non-Participating distributors (NPD), which had no contractual obligation to return pallets to CHEP. All non-preferred clients that could not return all pallets, because they were shipped outside of the CHEP network, were charged a "lost equipment fee" ranging from $20 to $24. However, it was CHEP's burden to prove that (a) the pallets had actually left the closed loop, and (b) which party was responsible for the leakage and eventual loss of the pallets.

By September 2002, CHEP reported that nearly 10 million pallets were leaked outside of the closed loop. About 3 million pallets could be tracked to known NPDs that had no obligation to return the pallets to CHEP. The other 7 million pallets were lost to out of network parties such as pallet recyclers or end-users who were hesitant to return the pallets or not aware that the blue pallets were rental property rather then part of the purchased goods. If CHEP could not collect those pallets, it would have to pay up to $21 per pallet for replacements or face losing annual revenue of $9 to $13 per pallet.

As an initial response, CHEP collaborated with a substantial number of out-of-network parties as part of their Asset Recovery Program and raised the awards for returned pallets. Moreover, a budget of $20 million was set aside for activities to recover and collect lost pallets. However, trying to recover lost pallets was merely a short-term solution of the symptoms rather than a long-term cure of for lack of traceability of and accountability for the pallets.

V. DISCOVERING THE POTENTIAL OF RFID [5]

In the mid 1990s, CHEP began to explore ways to improve asset tracking and customer service. At the time, the most common form of product identification was Universal Product Code (UPC), more commonly know as bar codes. Since their introduction in as a standard retail identifier in the mid 1970s, bar codes had risen to ubiquity. Virtually every product sold in the U.S. had a UPC symbol consisting of a human-readable 12-digit UPC number and a machine-readable bar code. The first six digits are a unique manufacturer identification number that is assigned by the Uniform Code Council (UCC). The next five digits were the product code that uniquely identifies product groups and packaging size. The last digit presented a check digit that verifies the integrity of the previous 11 digits.

The bar codes enabled to major innovations in the retail industry. First, items could now be identified and associated with a through a unique 12-digit number. Second, and more importantly, the machine-readability enabled semi-automated scanning, which improved the speed and accuracy of taking inventory or checking out at cash registers. The improved data quality also enabled retailers to analyze their sales and to track marketing efforts.

Despite the ubiquity of UPC and the success of related analyses applications, there were many settings and circumstances where barcodes were simply not a feasible solution to identifying and tracking items. The scanning of barcodes usually required a person that would either hold the item in front of a scanner or alternatively point the scanner directly at the bar code. For a successful scan, a proper reading angle, a fairly short distance (max. 2 feet) and a line of sight were necessary. Moreover, only one item at a time could be scanned, which incurred large lead times for sizable inventories.

For CHEP's purpose of tracking millions of individual pallets, bar codes were inadequate because most stacked pallets were outside of the reading distance or hidden behind other pallets. Moreover, the labor required to scan individual pallets at different location was enormous. Looking for alternative tracking technologies, CHEP management soon took note of the formation of the Auto ID Center and joined it as one of its first sponsors. In 1998, the Uniform Code Council, Gillette and Procter & Gamble teamed up with MIT to create the Auto ID center. The mission of the Auto ID was do develop and deploy technologies that would replace the UPC bar code. The center soon focused on Radio Frequency Identification (RFID) as an appropriate technology for replacing bar codes.
As a technology, RFID can be traced back to the 1930s. During the World War II, British planes would carry a transmitter, that when exited by radar waves, would broadcast a signal, identifying them as friendly aircrafts to the Allied radar station. RFID worked on the same basic concept: A tag, when exited by a radio wave sent by an external source, will reflect a slightly different signal back to the source. Based on the reflected signal, the source (or reader) can then identify tag.

[5] This section draws from [Roberti 2004].

A passive RFID tag could store 96 bit of information, allowing for a nearly infinite number of different Electronic Product Codes to be assigned. Thus, every tag and every associated item could be uniquely identified. In theory, a passive tag could be read from up to 10 feet away and no immediate line of sight was required for a successful read. More importantly, multiple tag readings were possible with a single scan. Thus, with the exception of water or metal blocking the radio waves, contents of entire warehouses could be read by simply walking or driving along the products, using a mobile reader.

However, by 1999 the technology's theoretical capabilities were not tested outside of a lab environment. Moreover, aside from prototypes, there were no commercial tags and readers available that would make a large scale implementation feasible. Thus, the CHEP management decided to become involved in the Auto ID imitative. CHEP agreed to provide the pallets fitted with RFID tags for potential field trials. The agreement was a big commitment, especially for a company that did not have experience with the emerging technology.

At the time, the choice of auto-identification technology was relatively easy, since only one company provided tags that were powerful enough to be read through common dock doors. The first challenge was to attach the tag to the wooden pallets. Tags could not be attached underneath the pallet because glue would not properly adhere to the wood. The option of affixing the tags to the top of the pallet was soon discarded since the tags would be exposed to constant wear through loading and unloading. The possibility of placing the tag inside the wood was also not feasible, since the material would partially block the transmission of the RF signal. With the lack of technological alternatives, CHEP engineers decided to attach a plastic board to the pallets where tags could be attached. This design worked until the pallets were loaded with products containing water or metal that interfered with the proper transmission of the RFID signal. The only technically feasible solution, a two-tag solution, could be implemented but was too expensive for a large-scale rollout.

Over the course of the next two years, the supply of RFID technology became abundant. Not satisfied with the outcome of the first prototype, CHEP started testing products from more then 30 technology vendors under various conditions. A team attached tags to different spots on the pallets and drove the pallets through a portal with readers.[6] The team tested the tags in environmental chambers that brought the temperature down to -20 degrees Fahrenheit or up to 140 degrees. Moreover, they emulated real-world conditions by putting tagged pallets on a machine that simulated the vibration of trucks and by intentionally dropping containers to guarantee the performance of the RFID system in the field. In the end, an angled tag, attached to the center block of the pallet, proved to be best design. The design fulfilled the stringent reading requirements while at the same time minimizing exposure to damage. [7]

By 2001, CHEP's RFID team had become expert in RFID implementation. EPCglobal, the successor of the Auto-ID center, adopted CHEP's readability and testing requirements as the official standard. In addition, formal and informal links into the standard development community were established that helped CHEP to shape the future of the RFID technology. However, there were no immediate returns on investment from the RFID-related research. RFID was still not implemented to solve CHEP's operational problems, and research expenses started to accumulate. By the end of 2001, the future of the project was in doubt. Fortunately, for the project, a new CEO was appointed in February 2002. Victor Mendes immediately saw the value of RFID, but he also was worried about the slow progress. He decided that the technology had to be implemented immediately instead of further testing it in controlled environments.

The Pilot

Donna Slyster, senior VP of operations, was put in charge of a team that included people from CHEP's IT, engineering, operations, and asset management departments. Having worked at EDS and General Motors, she was familiar with the implementation of new technologies. In order to have tight control over the pilot operations, Slyster decided to roll out the pilot close to the Florida headquarters. The team tagged 250,000 pallets with the aim of tracking them as they moved among 34 manufacturer locations and back to any of the six Florida service centers.

The Florida pilot had three distinct objectives: to "pressure test" the technology in a real-world setting, to identify supply chain and pallet management benefits, and, most importantly, to provide evidence for future investment decisions in RFID. As Slyster reflects:

> *We wanted to see if it was feasible to use RFID to track pallets through the supply chain. We wanted to understand the benefits we could achieve internally and for our customers.*

[6] The portal design is depicted in Figure 3 in Appendix III
[7] The final design is depicted in Figure 2 in Appendix III.

From a technology standpoint, CHEP already knew what to expect from RFID and how to fine-tune potential flaws. For instance, there were no products designed for mounting readers around dock doors, so CHEP engineers built a reader stand from pipe, fastened it to the doorway, and painted it yellow. Then they mounted four RF antennas to the pipe, two on each side. Cable was run from the antennas to a wall-mounted reader. Five dock doors, through which pallets enter the building, and two exit doors were fitted with this setup six distribution centers. In order to improve the durability of the tags, engineers also designed custom-made plastic cases that could withstand pressure, water, heat, and UV radiation. While this casing increases the cost of a single tag to $1, the life span of a tag now seemed infinite.

Discovering supply-chain benefits was a more challenging task. In order to take advantage of real-time data feeds into the readers at different locations, the data needed to be transmitted to a networked architecture. Integration problems quickly arose. Several applications needed to be integrated to capture, organize, and analyze the RFID data. To capture the data, CHEP had to implement an edge application that would enable the control of all readers, tags, and antennas. Moreover, the data needed to be integrated with the backend systems and the EPC network, in order to be shared across the supply chain. Lastly, the data needed to be analyzed. CHEP used warehouse management software from two vendors to manage the data at the distributor and retail level [Verisign 2004]. The overwhelming amount of data, along with redundant reads, seriously burdened CHEP's existing IT infrastructure. Thus, the pilot became a trigger for developing in-house software expertise as well as upgrading the IT infrastructure. CHEP invested $100 million in SAP enterprise resource-planning software and a state-of-the-art data center at its Orlando, Florida, headquarters, hoping that the infrastructure would enable the company to manage millions of small transactions each time a pallet is used, to collect the associated fees and to understand the complex movements of its assets.

Pallet management was the most pressing problem facing CHEP. Nobody at CHEP really knew how the pallets were flowing through the supply chain. One pallet management objective was to simplify and optimize the asset flow. Slyster and Mendes created performance indicators that could be calculated with the data gathered through RFID and checked daily. In 2003, the performance indicators are part of CHEP's robust monitoring and remote administration system, and in turn, this system was integrated with its existing legacy systems. Although Slyster would not exactly quantify the benefits for the pallet management operation, she contended that the results were convincing enough to launch a service offer for customers. For its RFID trial, CHEP only tracked the points of destinations for tagged pallets, which company returned the pallets, and whether they were damaged. Tracking the pallets originating from the 34 locations was a straightforward task, but as the system would expand and the amount of data mushrooms, the ability to capture, organize, and analyze the data would become important for CHEP and its customers.

After five years of a sometimes frustrating process of trial and error, CHEP had perfected a way to put RFID tags on pallets and to ensure they can be read virtually 100 percent of the time. CHEP had worked with a RFID manufacturer and created a tag that could be embedded in plastic and bent around the center vertical support block in a pallet. The tag was well protected and could be read regardless of the pallet's orientation. CHEP had gained invaluable RFID knowledge about tags, readers and the IT infrastructure needed to support them. CHEP had shaped the industry standards for RFID deployment and a technology expertise than was unmatched both in the supply chain or retail industry.

After the Pilot

Following the pilot, Slyster was promoted to CIO, and CHEP's RFID program was put under the leadership of Brian Beattie, SVP of Marketing. Puneet Sawhney was appointed as the Program Manager for RFID, and reported directly to Brian. The leadership team decided that for CHEP's RFID program to succeed in the current environment, it had to be marketed to its supply-chain customers. Although the pilot was a technological success that helped CHEP to understand its own business processes on a small scale, there was no immediate return on the $20 million investment in the technological development. If Brian and Puneet could convince key accounts to adopt RFID and to build the network infrastructure, CHEP could trace the product-flow of its assets. Since the CHEP business model involved transfer of pallets when they are shipped from its service center to the manufacturers and then to the retailers, better information sharing would be a win-win situation for all the parties, leading to real-time asset management and control.

Around June 2003, when CHEP concluded its pilot, a major event in the industry changed the pace of RFID adoption. Wal-Mart announced a January 2005 deadline for its top 100 suppliers to begin shipping on RFID-enabled pallets and cases. If widespread adoption is what makes any technology successful, then the Wal-Mart announcement would be the reason for RFID's success in the retail supply chain. With an annual turnover of $260 billion, Wal-Mart was the largest retailer in the world and is capable of setting the agenda for retail supply chains.

For retailers, key RFID features and the derived benefits of this technology made a compelling case. Through real-time data capture, a finer granularity of information capture and accurate information-sharing processes could be automated that would lead to reduced labor and product-handling costs. Also, revenues could be increased through better inventory management and the reduction of out-of-stock losses. However, despite theoretical benefits, the reactions of both suppliers and retailers to the new technology proved difficult to gauge.

VI. MOVING FORWARD

After reviewing their clients' current initiatives, Brian and Puneet were convinced that they had a solution that would address both their clients' needs and the improvement of internal operations. If the main fears of the manufacturers were cost and lack of expertise with the technology, CHEP could provide an economical solution for the pallet tagging. Instead of affixing a new tag to cases every time an order is shipped, it would simply read the code of CHEP's pallet, which then could be associated with the loaded products. In that scenario, the manufacturers would save on variable costs and would have a small, fixed-cost investment in the readers and the connection to the back-end systems. Renting the RFID-enabled pallets would be slightly more expensive, but the client's net costs would be far less than the expense of developing their own RFID solution.

The Wal-Mart compliance requirements of the client were well aligned with the new "PLUS ID" Service. For a surcharge of US$ 0.49 per pallet trip, clients would receive RFID-enabled pallets. With the PLUS ID program, clients would not have to worry about installing the technology. Similar to the pallets themselves, the clients would rent a high-quality technology that simply worked. Moreover, the PLUS ID tags would be rewriteable, enabling the clients to store information about the products loaded onto the pallet. By taking advantage of PLUS ID, clients would be able to improve their supply chain administration and improve their product management.

It was a story similar to that of Electronic Data Interchange and bar codes of the prior decade. The manufacturers needed to comply with the requirements of the retailer community. However, the uneven pace of the standards adoption forced compliance of only a limited number of their larger customers, a circumstance that demanded their investment in infrastructure. For their part, Wal-Mart, Target, and Albertsons were open to the standards and practices issues and seemed to accommodate to standards and processes that served both sides of the exchange. With the PLUS ID service on the horizon, CHEP seemed poised to offer its clients—both manufacturers and retailers—an effective approach toward aligning the strategies of the entire supply chain.

Despite the potential for higher supply chain visibility and better data analysis in the future, both manufacturers and distributors were hesitant to adopt the PLUS ID service. [8] Given the uncertainty in the development of the technology and the final requirements of the Wal-Mart mandate, the clients tried to minimize their initial technology investment. The most common approach to deal with the Wal-Mart mandate was to simply attach single-use RFID tags to the cases and ship them to Wal-Mart. The "slap-and-ship" approach, as it was called in the industry, did not require building a reader infrastructure, which could cost up to $10.000 per portal, or integrating new middleware. The information on the tags would never be read by the manufacturers. The manufacturers did not want to invest into systems infrastructure until industry-wide standards for the technology were set.

While the CHEP solution was state of the art, a difference of 49 cents per pallet trip, which corresponds to an 8 to 10 percent price increase to the cost of a regular pallet trip, was significant to suppliers that already had lower margins than their peers that did not deal with the large retail chains [Riper 2007]. Convincing manufacturers to buy a service that promised future benefits but no immediate efficiency gains would be a hard sale to make. Moreover, the clients argued that CHEP only wanted to recoup its initial technology investment at their expense while, at the same time, reaping the benefits of the internal process improvements. CHEP, on the other hand, argued that the services would only work if all the pallets were equipped with RFID, making the investment necessary.

CHEP's RFID team faced a classical chicken-and-egg problem: CHEP could only realize the potential of RFID tags if it generated enough critical mass, both in terms of customers and revenue, to equip fully all pallets. However, clients were not able to make investments before the technology was proven, the infrastructure was in place or before the benefits of the system could be realized. Beattie knew that the PLUS ID Service would only be the beginning of a variety of value-added services as long as he could convince a few customers to carry the burden of the infrastructure investment. Was it really too far-fetched trying to transform the company known for providing blue pallets into a trusted logistics partner that adds value across the supply chain as a whole?

[8] See "General Products" in Appendix II for an exemplary manufacturer's take on RFID.

CASE QUESTIONS

1. What are the costs associated with the loss and underutilization of the pallets?
2. Why would CHEP choose RFID technology to improve its operations?
3. What RFID-enabled business services should CHEP offer in the future? Can CHEP create value that transcends its traditional value chain?
4. Should CHEP focus on its core business or should it utilize its technology expertise to become a supply chain information provider?

APPENDIX I. STAKEHOLDERS ATTITUDE TOWARD RFID ADOPTION

Value-Rite

As one of the major retailers in the U.S., Value-Rite had revenue of $30 billion in 2003. It was looked on as an innovator in the retail industry. With clean stores, wide aisles, and many choices, this chain still attracted a wide variety of customers. To achieve its goal of low costs and best prices, Value-Rite had to constantly reengineer its supply chain.

Over the last five years, Value-Rite had grown at an impressive rate of 15 percent annually. It had aggressively challenged the competition in major markets, driving both top-line and bottom-line growth. With a major focus on network expansion and cost reduction, its management realized that it will have to depend heavily on the latest developments in information technology.

Value-Rite's management felt that RFID would be a key enabler for removing redundant costs from the supply chain. Its CIO, Tilda Limman, was excited about the benefits of this technology. She stressed that RFID will help Value-Rite serve its customers much better:

> *When you shop at Value-Rite on a Saturday afternoon, there's a pretty good chance many items aren't on the shelf anymore. Associates do their best restocking items, which is one of our biggest challenges. We know when inventory comes into the building. We don't know exactly where and when it needs to go from the backroom to the shelf. We have looked at this 100 times in the last 10 years. All the technology we reviewed would put restrictions on our ability to move products around the store and out to the customers. We know the quantity, but don't have a clue where the merchandise is. If anyone has been in the back room of a major retailer at Christmas, finding product can be a daunting task. That really was the killer application. And we don't have to have 100* percent *reads. If I miss the read to the floor, I get it coming back from the floor and then to the compactor.*

While the benefits of this technology were apparent, there were also many challenges associated with its implementation. The biggest challenge was the lack of uniform technology standards that would enable faster adoption at reduced cost. In order to facilitate the establishment of such standards, Value-Rite, had sponsored EPCglobal and was closely monitoring its current developments.

As a large retailer, Value-Rite did not want its suppliers to perceive that the implementation of RFID will increase its costs without any tangible return. Interestingly, when Value-Rite planned the business case, it believed that the technology would work with cases and pallets and that it could justify investing in RFID. Says Tilda,

> *It felt similar to what happened with barcodes. In the 1980s, somebody had to take a brave step. It was a chance to see if we could bring some companies along with us. Therefore, the biggest challenge is to communicate effectively to its suppliers, so that they have clarity on what Value-Rite is expecting from them. With RFID, the biggest challenge is communication—trying to keep our suppliers less confused based on whose article they read last. You have no idea how much time that consumes. They're calling every week, nearly every day. I spend a lot of time talking with suppliers.*

While Value-Rite feels that there are obvious benefits for all its suppliers, it is sensitive to the investments that these companies have to make in tags and reading equipment. Therefore, it has collaborated with other key retailers to implement a phased geographical rollout beginning January 2005, starting with the Dallas market.

After she signed he capital expenditure for the RFID related investment for the Dallas distribution center, Tilda asked herself, “I know this one's not going to fail. But will it play out how we've envisioned it?”

General Products

General Products Inc. was one of the largest cereal and packaged food manufacturers in the world. Headquartered in Chicago, IL, it had business interests all over the world. With 12 production sites and 13 regional distribution centers, General Products had a $60 billion yearly turnover.

General Products had played a key role in RFID adoption in the retail supply chain and had participated in the Auto ID Center’s field test, as well as other industry sponsored RFID pilots. It believed that RFID will have considerable impact in reducing the inventory costs throughout the supply chain.

Over the years, General Products has supported many industry-wide initiatives, such as EDI (Electronic Data Interchange), VMI (Vendor Managed Inventory), and CPFR (Collaborative Planning, Forecasting, and Replenishment). While all these initiatives required a significant time commitment, few of them actually delivered the benefits that they promised. With this discrepancy in mind, General Products supported the RFID efforts of its key retailers with cautious optimism, especially since it required large capital investments before any returns could be expected.

With its key retail customers driving toward “everyday low prices,” there was tremendous pressure on General Products to reduce its costs. Any increase in packaging costs (since they are now required to put RFID tags at the pallet and case level) would not be sustainable unless a clear ROI is proved.

To limit its risk and to ensure that existing operational processes had minimal disruption, General Products adopted the “slap-and-ship” approach. However, the retailers argue that using this method would prevent companies from integrating RFID technology into their business processes, thereby limiting any returns on the RFID investment.

Mark Gumm, senior director of IT, says that General Products used “slap-and-ship” because it let the company learn about and experiment with the technology. “We prefer to call it ‘tag-at-ship’ not ‘slap-and-ship’, because it has proven to be a very successful process," Mark said about the method, which had a 96 percent success rate for case reads at General Products.

“It's unclear what General Products’ ROI will be after RFID implementation,” Mark says. He also worried about application and tag cost, which was still between 20 and 60 cents per tag. "Equipment purchases could become obsolete and we are still lacking automation and high-speed encoding," Mark said about other RFID challenges.

According to Mark, only 30 percent of General Products’ total volume goes to retailers that mandated RFID at the case and pallet level. Unless more retailers announced similar mandates, it would be expensive for General Products to incorporate RFID tagging into its manufacturing and operations processes.

General Products, like other key suppliers, viewed the RFID mandates as the beginning of industry-wide experimentation. With the current read rates less than 100 percent, this technology was not deemed dependable enough for commercial transactions. Reflecting on the future of RFID Mark says:

> *We currently look at this initiative as a mere cost of doing business with the key retailers. If they want the mandates to be successful, the retailers need to share the costs as well as the benefits that they will get in their supply chain. Unless that happens, this would be looked as another arm twisting exercise by the mega retailers, and RFID will die a slow death.*

APPENDIX II. SELECTED FINANCIAL DATA

CHEP AMERICA (in million USD)	2006	2005	2004	2003
Sales Revenue	2956.4	2762.6	2440	2048
Operating Profit	703.8	534.4	393.6	318.5

CHEP AMERICA SALES by service (in million USD)	2006	2005	2004	2003	2002
Pallets	2571.7	2376.2	2122.8	1761.3	1485.0
RPC	177.4	165.8	146.4	122.9	104.8
Automotive	147.8	138.2	97.6	81.9	69.9
Other	59.1	82.9	73.2	81.9	87.4
Total	2956	2763	2440	2048	1747

CHEP AMERICA SALES by Region (in million USD)	2006	2005	2004	2003	2002
Americas	1330.2	1188.1	1073.6	962.6	856.0
Europe	1241.5	1215.7	1073.6	880.6	716.3
Rest of World	384.3	359.2	292.8	204.8	174.7
Total	2956	2763	2440	2048	1747

CHEP USA	2006	2005	2004	2003	2002
Size of Pallet Pool (in million)	93	87	84	80	70
ROCI (annualized)	25%	16%	10%	9%	10%

CHEP AMERICA	USA	CANADA	Latin America
Sales Distribution	80%	10%	10%

Source: Brambles 2007

APPENDIX III. PICTORIALS OF RFID INFRASTRUCTURE

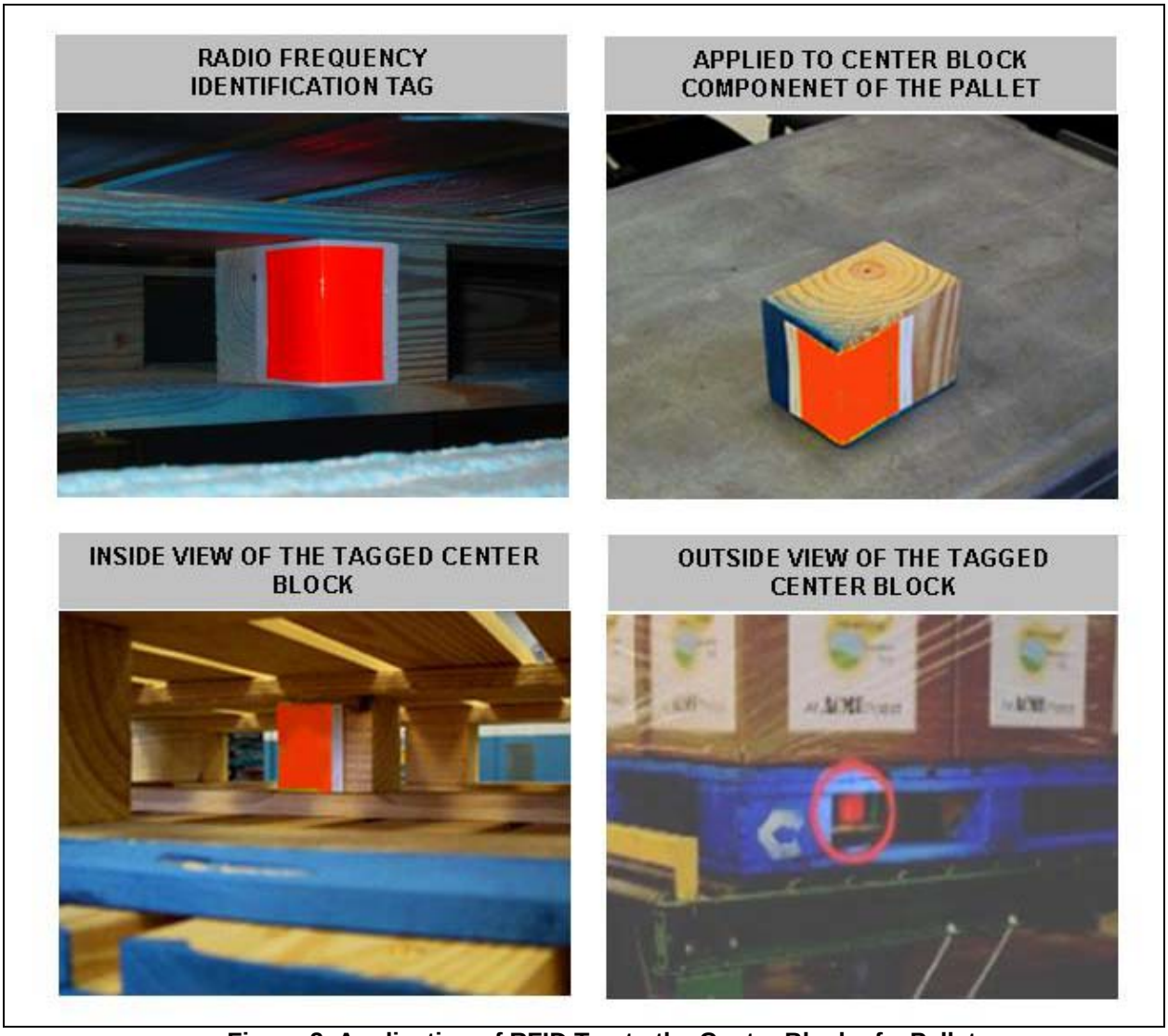

Figure 2. Application of RFID Tag to the Center Block of a Pallet

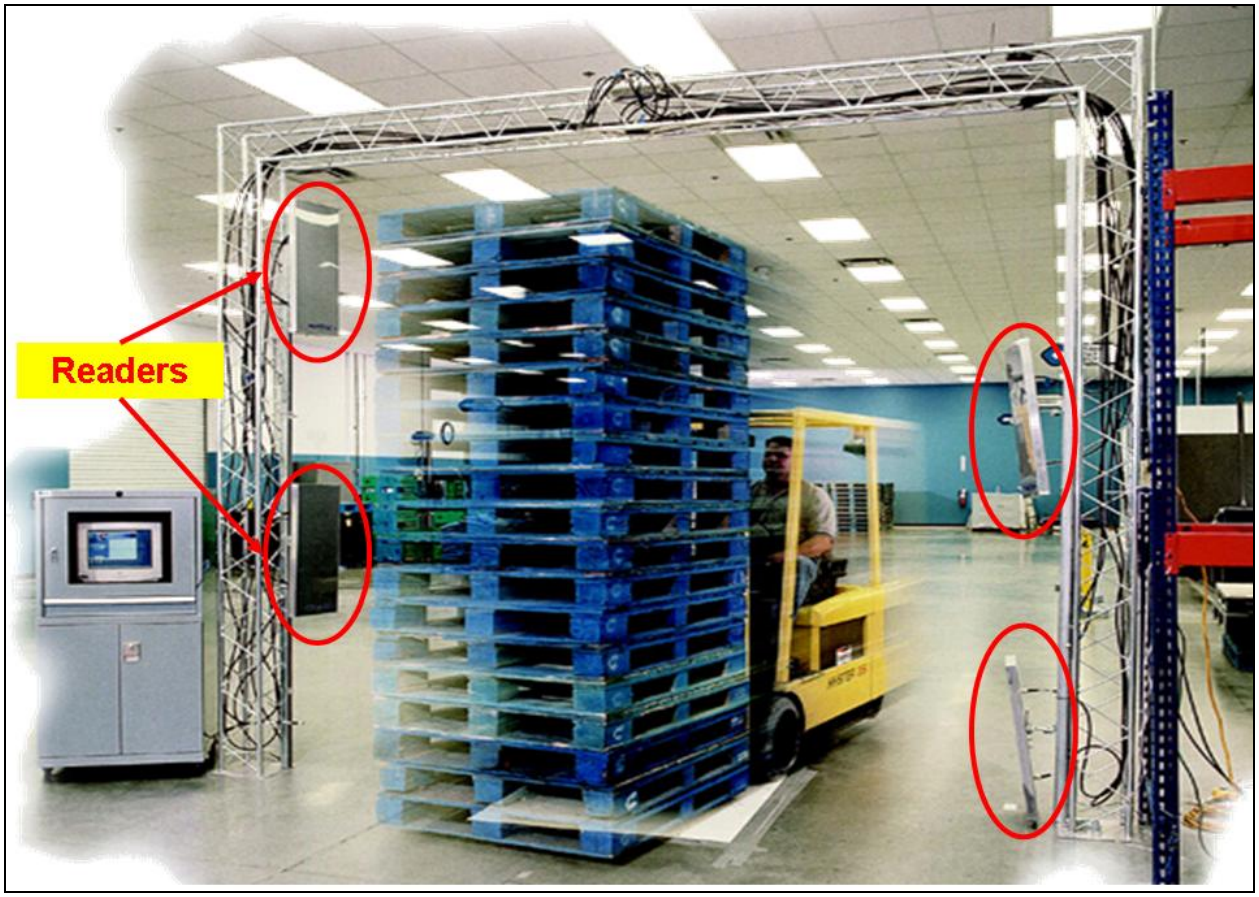

Figure 3. Reader Portal

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PART B: CHEP: TRACKING THE PROGRESS

I. INTRODUCTION

By the end of 2003, CHEP made the decision to proceed with its RFID development. While a pool of RFID-enabled pallets would bring benefits both to their internal operations and to their customers, it was clear that further investment would have to come from outside of CHEP. With the initial deadline of January 2005 fast approaching, there was hope that that the Wal-Mart mandate would increase demand for the RFID-enabled pallets, tagging the complete pallet pool as a by product of the retail giant's pressure. At the same time, Beattie and Sawhney understood that they would have to quantify the both the network and the individual benefits for CHEP's customers in order to receive the infrastructure investments and to secure long-term contracts for the RFID-enabled pallets.

II. EXTENDED PILOTS

In order to better communicate the benefits of RFID in the supply chain, Sawhney decided to conduct broader research on RFID studies and to set up use cases with selected partners. First he gathered information on key benefits from previous studies. A study conducted by IBM showed that an RFID-enabled supply chain could lead to 7- 20 percent increase in labor efficiency. Studies by the Auto ID center found similar results in efficiency (3-12 percent), and also concluded that inventory cost of losses, maintenance and item returns could be reduced in the 10 and 20 percent range. While those numbers where promising indicators, the CHEP team realized that they would have to show that their own technological solution could provide similar, if not better, results for its clients. Thus, a new pilot study that reached across different supply chain links was designed.

Having learned from the experiences of the internal pilot the team decided on a different set up for the pilot in late 2004. First, they decided that this time around selected partners would have to partake in the pilot to share the costs as well as to increase the credibility of the project. Specifically two major manufacturers and a large retail chain in the Brazilian market decided to support the project. Moreover, the experiment was significantly narrower in scope and smaller in size, with only 1000 tagged pallet moving between the 13 distribution centers of CHEP, the manufacturers and the distributor.

Focusing mainly on the areas of shipping and receiving and information interchange, the two month pilot provided valuable lessons and performance indicators. Most importantly, an estimate on the Return on investment (ROI) could be made: For high priced retail items such as perfumes or razors a positive ROI could be expected in the third year of operation whereas low margin dry goods would not yield a positive ROI until the ninth year of RFID-enabled operation. Moreover, the experiment convinced both manufacturers to enter into long-term contracts with CHEP USA by 2006, both sharing the cost of the tagging and paying premium prices for the use of 10,000 RFID-enabled pallets per month.

III. WAL-MART RFID MANDATE AND COLLABORATION

Equipped with the positive results and the announcement of the two manufactures the CHEP team was confident that more customers would agree to use RFID-enabled CHEP pallets. However, Wal-Mart delayed the deadline for its mandate several times, reducing the pressure on its suppliers to adopt RFID-enabled solutions. Moreover, after experimenting in their five Texas distribution centers for several years, Wal-Mart recognized in late 2006 that for their purposes the RFID enablement of the stores should take priority over the use within the whole supply chain. An executive stated that out of stock products had already dropped by 30 percent and the efficiency of moving products from the backroom to shelf had increased by 60 percent. Thus the focus on the RFID mandate shifted from delivering store information to the suppliers rather then optimizing the supply chain.

Despite the setbacks, CHEP further intensified its collaboration with Wal-Mart. In 2007, CHEP agreed to provide its pallets free of charge to Wal-Mart, as an attempt to convince affiliated manufacturers to use (and pay for) CHEP pallets. [Burke 2007]. Further, CHEP became an integral part of Wal-Mart's green packaging initiative, an effort to reduce waste associated with the packaging process. Wal-Mart, promoted the CHEP pooling model as the most environmentally friendly packaging alternative [Brindley and Harrison 2007].

IV. INNOVATION AND COMPETITION

The success of CHEP's pooling model did not go unnoticed. Several competitors created businesses models that where strikingly similar to CHEP. While companies such as IGPS where unable to compete with both the size and the network density of CHEP's pallet pool, they would challenge CHEP with new innovative products and services. IGPS, developed a plastic pallet that was 30 percent lighter and was projected to last 10 to 20 years longer than CHEP's wooden counterpart [Lacefield 2007]. Being led by a former CHEP executive and having a smaller pallet

pool, IGPS had the foresight to equip all pallets with four RFID tags. Yet, only in late 2006 IGPS announced pilots to test the technology, lagging behind CHEP by nearly three years. Also, with a price point of over USD 60 per pallet, IGPS was hard fought to steadily increase its pallet pool to realize economize of scales and network effects.

CHEP reacted to the new competition by further innovating RFID technologies and by expanding the PLUS ID service beyond the wooden pallets. Realizing that its clients would be slow to adopt into RDID reader infrastructure, CHEP decided to accommodate older reader technologies that were already in place at most facilities. The result was the 3-in-1 tag that was readable by RFID readers, barcode scanners and, last but not least the human eye. The multi-mode readability enabled tracking across the entire supply chain, as long as the data was fed back into the information system. In addition, the new tags were also rewritable, allowing customers to store specific information, such as shipping date, or destination aside from the predetermined "license tag numbers" assigned by CHEP [CHEP 2006].

V. LOOKING AHEAD

By 2007, selected clients had opted in to the Plus ID program. RFID pallets were shipped on an on demand basis, to customers that had agreed to pay the PLUS ID surcharge. While no exact numbers were published, it was estimated that every month between 10,000 and 20,000 RFID-enabled pallets were issued from the CHEP service center. While this was only a small portion of the pallet pool, it allowed CHEP to continuously tag new pallets, an effort that essentially was paid for by the PLUS ID revenues. It would be a long way to tagging all of CHEP's pallets but the experiences from the pallet business were invaluable for the other lines of business.

CHEP aggressively moved into new customer segments. In late 2006 CHEP started to tag its plastic containers [RFID Update 2006]. Tagging its plastic containers with RFID technology enabled CHEP to further expand its pooling model to the automotive, beverage, and raw materials industries. Furthermore, CHEP also started to markets services related to the expertise gathered in the pilot studies. Named Supply Chain Consulting, a group of technology and supply chain experts offered their services to clients and external customers.

In the beginning of 2007 Beattie and Sawhney looked back at the last five years and realized how far they had come. The RFID related innovation had helped CHEP maintain market leadership in the pallet business, while at the same time fostering CHEP's reputation as one of the most innovative companies in the supply chain business. Moreover, the spill-over effects into other industry segments and the creation of new services were seen as a good signs to manifest CHEP as a key player in the logistics industry. Although they not achieve the initial goal of tagging the complete pallet pool and having the all of its customers equipped with RFID infrastructure and corresponding data management software, they still saw a bright future for CHEP and its RFID-related business.

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