Adoption of RFID Technology: The Case of Adler—A European Fashion Retail Company

Roland Leitz, Andreas Solti, Alexander Weinhard, and Jan Mendling

Abstract

(a) **Situation faced**: Adler Modemärkte AG (Adler hereafter) is a fashion retailer that operates mainly in the German-speaking countries. At the beginning of the twenty-first century, first movers in the fashion retail sector began to adopt RFID technology. Adler monitored this new technology and decided to adopt it in 2010, even though it was not sure at that stage whether its use would be profitable. However, Adler hoped to improve process efficiency and effectiveness in the long run to increase customer satisfaction through faster checkout. Moreover, the company expected that RFID technology would help to prevent theft, and to provide better visibility of inventory.

(b) **Action taken**: Careful planning is required if the goals and promises of RFID are to be achieved. With the help of a consultancy, Adler managed the adoption of RFID as a project that spanned 2 years. The overall concept was first sketched and designed, followed by selection of a suitable provider for the required hardware and tag supply. Next, the concept was realized and prepared for rollout before employee training was provided and the new technology was rolled out in more than 170 stores.

(c) **Results achieved**: Most of the project's goals were achieved. Inventory accuracy and transparency of the flow of items contributed to an increase in

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J. vom Brocke, J. Mendling (eds.), *Business Process Management Cases*,
Management for Professionals, DOI 10.1007/978-3-319-58307-5_24

sales. RFID also improved the follow-up procurement of items, resulting in additional increase in sales. The efficiency of in-store processes was improved through faster item registration, and the speed of the customer payment process at the point of sale was significantly improved, thanks to parallel scanning by RFID-enabled cash desks. Finally, retail shrinkage was reduced.

(d) **Lessons learned**: Careful planning is required when conducting large improvement projects, including delegating responsibilities, as consultancy companies are specialized and experienced in managing such transition projects; doing an early check on the feasibility of process improvement projects; waiting for the right moment to conduct the project; and considering the project's critical risks and people's sensitivities.

1 Introduction

Adler Modemärkte AG (Adler hereafter) is one of the leading textile retail chains in Germany and one of the largest. At the end of 2015, the group operated 177 stores, 153 of which were in Germany, 21 were in Austria, 2 were in Luxembourg, and 1 was in Switzerland. With more than 4000 employees, Adler focuses on large stores with spacious sales floors, wide aisles, and spacious fitting rooms and rest areas. The company sells an average of around 27 million items per year. The company also operates an online shop at www.adlermode.com.

Adler's management first considered radio frequency identification (RFID) technologies in 2002, when they envisioned migrating to the novel and improved processes that advocates of RFID technology promised (Chappell et al. 2003). However, since preliminary estimations of the costs entailed in transitioning were high, the company's management put the idea on hold until 2005 when, encouraged by some early success stories, the company reconsidered the idea. Adler conducted a thorough feasibility analysis of a shift to the RFID technology, but the costs of equipping all of its products with RFID tags still outweighed the expected gains with respect to process optimization. The idea needed more time.

In 2009, after some changes in the company's management, Adler re-evaluated the issue (Adler Modemärkte AG 2015, p. 11). The new management recognized the potential of RFID to provide benefits like highly transparent logistical processes, improved in-store replenishment, and more effective electronic article surveillance (EAS) (Thiesse et al. 2009). As increasing numbers of the company's competitors transitioned to radio frequency technology for the purpose of source tagging and theft prevention and there was a dramatic drop in the cost of tagging items with RFID labels, the visionary ideas from 2002 finally became practicable in 2010. Changes in the company's infrastructure, such as replacing the exit gates, were overdue to improve theft prevention, so management decided to use the opportunity to make a full transition to RFID technology. In 2012 Adler invested roughly 3.4 million euros in its RFID project (Adler Modemärkte AG 2013, p. 39).

2 Situation Faced

The adoption of RFID technology at Adler was driven less by the need to solve problems than by the potential benefits of the new technology. We use the Business Process Management (BPM) Context Framework developed by vom Brocke et al. (2016) to describe the situation the company faced in Table 1.

The Goal Dimension Even though RFID is seen as an innovative technology, Adler's main goal was to improve its existing processes. Distinguishing between articles on the sales floor and articles in the stockroom had not been feasible because tracking transitions between the two areas would be slow and cumbersome if employees had to scan every item brought back and forth. Consequently, there was always a high risk that popular sizes and colors of high-volume articles were not available on the shelves, even though they were in stock. With an average of 70,000 items per store, Adler faced the potential of lost revenue (Adler Modemärkte AG 2015, p. 11). With RFID technology, a fixed scanner could be installed between the stockroom and the sales floor to scan the passing items automatically, requiring only that the employees traverse the gate carefully to ensure high accuracy in the system. In order to minimize errors, Adler conducted training sessions so that the employees knew how to pass through the gates correctly when they were carrying store items.

The Process Dimension Adler redesigned its structured *repetitive core processes* based on the needs of the RFID technology. At the start of the project, efficiency and standardization of the processes were in focus. Most processes were simple and

Table 1 BPM context framework (vom Brocke et al. 2016) applied to the Adler case

Dimensions	Characteristic	Value
Goal	Focus	Exploitation (Improvement, Compliance)
Process	Value contribution	Core processes
	Repetitiveness	Repetitive
	Knowledge-intensity	Medium knowledge-intensity
	Creativity	Medium creativity
	Interdependence	Medium interdependence
	Variability	Low variability
Organization	Scope	Intra-organizational processes
	Industry	Product industry
	Size	Large organization
	Culture	Culture medium supportive of BPM
	Resources	High organizational resources
Environment	Competitiveness	High competitive environment
	Uncertainty	Medium environmental uncertainty

had only a *medium level of knowledge-intensity*, and the process *variability* could be considered low because the processes were standardized across all Adler stores.

One potential process improvement was at the goods-receiving step. Before the use of RFID, the delivered merchandise had first to be removed from boxes. Then an employee checked to ensure that the delivery matched the order by scanning each item individually by hand. With RFID, apparel delivered on hangers are scanned with a handheld reader in an instant, and the stock management system captures the new goods (Adler Modemärkte AG 2015, p. 10). Boxed items can be scanned in one batch.

The RFID technology also promises significant process improvements for the point-of-sale process. Originally, barcodes of every item purchased were manually scanned at checkout with an installed or hand-held barcode scanner. Now, however, the RFID-enabled tags can be read in a batch when a number of items are placed on the checkout desk. The cashier needs only to count whether all items were detected by the system and does not have to look for barcodes.

Adler's previous electronic article-surveillance system relied on attaching bulky and expensive anti-theft hard tags. Employees and suppliers had to perform a time-consuming process to apply (and remove) the hard tags, which carried the risk of damaging the items if the employees executed the process incorrectly under time pressure. In addition, only 20% of the stores' articles could be secured this way, as the cost of this process was not feasible for items of lower value (Adler Modemärkte AG 2015, p. 12).

Finally, the RFID technology speeds up manual inventory counts, as RFID handheld scanners can simultaneously detect hundreds of items. Therefore, laborious and expensive manual counting can be reduced or eliminated in favor of more frequent inventory "sweeps."

The Organization Dimension Over 3 years, Adler invested 8 million euros into its RFID project. Thus, the resources allocated to the project can be characterized as high.

Intra-organizational processes were most of the project's focus. However, in order to fully leverage the benefits of RFID technology, some of the company's third-party suppliers also had to change their barcode-based processes.

The Environmental Dimension BPM is important for Adler because the high level of competitiveness in the retail fashion sector makes streamlined processes that waste no resources essential. Customer demand is difficult to forecast in the industry, which leads to some *uncertainty*. In addition, new developments in RFID technology require rapid modification of existing processes in order to realize the new technology's full benefits. For example, Adler is considering using robots equipped with RFID readers to perform the stock-taking. Consequently, the level of environmental uncertainty can be characterized as medium.

Another example of a source of uncertainty is new technological advancements that allow RFID tags to be integrated into sales articles, such as by being sewn into garments or placed in shoe soles, in order to make it difficult for a customer to leave

Table 2 Project goals and the corresponding KPIs supported in the RFID process-improvement project

Project goal	Supported KPI
Increased inventory accuracy and transparency of commodity flow	Turnover
Reduced "off of shelf" situations	Turnover
Parallelization of scanning activities	Processing time
Faster checkout process	Customer satisfaction
Increased anti-theft protection	Shrinkage

the store with unpaid items. These measures make it necessary for Adler to change the existing process but also help it to mitigate the problem of theft.

Table 2 summarizes the project's goals and relates them to KPIs that benefit from the RFID technology. For example, RFID allows a retailer to conduct inventory checks more frequently using handheld devices, leading to earlier detection of misplaced, lost, or stolen items. In such cases, employees can replenish the missing items from the stockroom or order them. Consequently, the chance of lost sales opportunities is reduced, as customers are less likely to encounter situations in which the items they want are not on the shelf.

Not only is anti-theft protection increased because the RFID tags and can be attached to more items than was possible with the previous technology with hard tags, but the RFID tags are cheaper.

3 Action Taken

The first planning for the RFID project began in 2010, when Adler began to search for suitable software and hardware solutions. In order to manage the extreme complexity of such an RFID project, Adler needed qualified system-integration experts as well as software and hardware components that integrated well into its existing system (Adler Modemärkte AG 2015, p. 12).

The adoption of a new technology in multiple locations requires thorough coordination and planning, so Adler hired an independent consultancy to manage the transition project. The project was partitioned into three main phases, with an initial business case analysis and trailing economic feasibility studies. The project plan is outlined in Fig. 1. In the following subsections, we describe each phase in detail.

3.1 Concept and Provider Selection

In a first step, Adler's project management team and a hired consulting firm analyzed the company's and customer's requirements, including an analysis of the existing ERP system (Adler Modemärkte AG 2014, p. 13).

The project management team screened potential suppliers of RFID equipment that were located in the vicinity based on Adler's envisioned solution and required

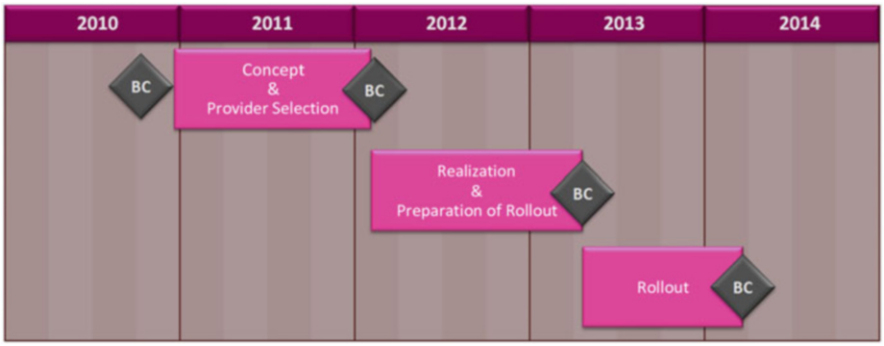

Fig. 1 Project plan for the adoption of RFID. Three main phases are depicted, each followed by a business case analysis

tools and processes. In addition to economic considerations, Adler had to consider the slight differences in the RFID reader technologies in selecting a provider. Spending time on the selection process is important because switching to another provider after installation might require replacing parts of the infrastructure at additional cost. In 2011 Adler selected its Weiterstadt store as a test store (Adler Modemärkte AG 2014, p. 13). First, it tested several software tools and hardware components in order to evaluate how well they interacted with each other. After a period of several months, Adler had a list of the most suitable hardware and software and corresponding suppliers (Adler Modemärkte AG 2014).

The conceptual design of the to-be processes requires a thorough understanding of the business and in-depth knowledge of the new technology's merits and potential pitfalls. For example, the company did not know initially to what extent RFID gates had to be physically shielded from the surrounding shop area to prevent false reads when store items passed near the gates. The cost of correcting an improper initial setup are much higher than the costs of adding extra shielding in the first place.

3.2 Concept Realization and Preparation for Rollout

Once the suppliers had been selected and planning of the placement of readers and processes had been set up, Adler was ready for the realization. To prepare for smooth rollout, feasibility of the new technology had to be tested. A conceptual prototype was set up in a test environment to validate that the components all worked together as expected and were ready for use in the stores. An example installation covering the focal points in a store with RFID readers is shown in Fig. 2. The figure shows a receiving cage, the replenishment gate between the stockroom and the sales floor, the checkout, and the EAS gate. The fitting rooms can also be equipped with RFID readers to offer customers additional information (available sizes, colors) about the products they bring to the fitting room.

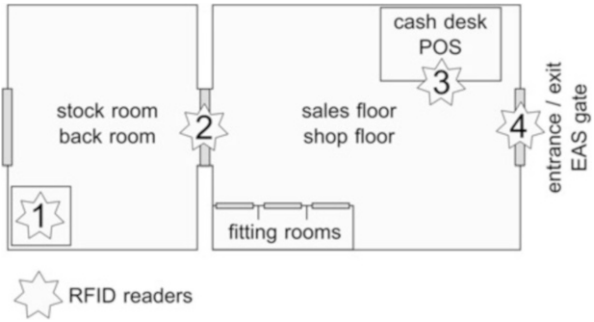

Fig. 2 Sketch of RFID gates and readers in a retail store

After selecting the supplier, Adler began the pilot project in Weiterstadt in the spring of 2012. The store was equipped with all systems, such as the chosen RFID-enabled handheld devices and RFID printers, and all garments were tagged with RFID transponders. The pilot was intended to demonstrate whether the assumptions the company had made about RFID were correct, whether the selected systems worked as expected, and whether the project's goals could be achieved. Months of testing preceded the pilot because employees had first to be trained on how to interact with the RFID infrastructure and systems and convinced that the new processes were better than the old ones so they would use them appropriately (Adler Modemärkte AG 2015, p. 13).

The pilot was expanded to five more stores in Germany and two stores in Luxembourg, all of which had different architectural layouts. This expanded testing provided a broad dataset that verified the positive results from the first pilot in Weiterstadt (Adler Modemärkte AG 2015, p. 14).

After briefly evaluating the feasibility and efficiency of the setup in the eight pilot stores, the upgrade was extended to six additional stores in late 2012. Meanwhile, tag delivery for source tagging was set up so the suppliers could integrate the tags required by Adler into their own processes. The IT infrastructure for handling the RFID events and providing monitoring and reporting was set up in summer 2013. Simultaneously, the stores were equipped with handheld devices for uses from inventory counting to tagging of new items.

The RFID gates and scanners were planned in autumn 2013. Important monitoring points for the processes in retail stores are points at which items enter and exit the store, the transition between the sales floor and the stockroom, and of course the point-of-sale counters.

The goods-receiving process was almost completely automated with scanners, as depicted in Fig. 3 for hanging garments and in Fig. 4 for boxed items. The automatic processing frees the staff to focus on core processes like assisting customers.

All required infrastructural changes were due to be implemented in January 2014 so a timely rollout could be ensured with subsequent tagging of the inventory.

Fig. 3 Receiving hanging garments

Fig. 4 Receiving boxed items

3.3 Rollout

One essential step in the use of RFID technology is the tagging of all the items in the store. This step required 9 months, from July 2013 until March 2014, and considerable effort. Meanwhile, the stationary readers were installed so employee training and go-live could be performed in succession.

The rollout was scheduled for a transition period from August 2013 to April 2014. Adler began by equipping four stores per week with RFID technology. Then, with more routine and first lessons learned, the company was able to double the pace to eight stores per week.

The rollout was smooth and saw no further delays or complications, so Adler stayed on plan and completed the rollout by April 2014, 5 months ahead of schedule (Adler Modemärkte AG 2015, p. 14).

After all of the stores went live, additional training and software releases that catered to Adler's specific needs took place from May 2014 to June 2014. The RFID adoption project was finalized by the end of June.

4 Results Achieved

The adoption of RFID technology at Adler was strategically relevant to the company's management. Besides economic factors, the modernization and the more efficient checkout process positively affects the company's brand image. In short, the improvement project was a success, with improved inventory accuracy, follow-up procurement, process efficiency, processing at the points of sale, and source tagging and theft protection. The following subsections discuss these results and how they contribute to the business goals.

Better inventory accuracy and transparency of the flow of items between the back of the store and the sales floor. The new technology makes it feasible to track items' movements in the stores in real time. The inventory management system can identify items that need to be replenished from the back of the store, reducing the chance that customers will miss a certain type or size of garment that is only in the back of the store. The higher inventory accuracy in the system supports an increase in the turnover.

Improved follow-up procurement is enabled by improved inventory accuracy. When items go missing from the sales floor because of theft, administrative mistakes, or other reasons, early detection of these issues can be improved by regular inventory "sweeps." In these inventory sweeps, employees walk around in the store with the handheld RFID devices to detect inventory anomalies. Adler assumes 99% accuracy for RFID-enabled stock-taking (Adler Modemärkte AG 2016) and has begun to test robotic counting in one of its flagship stores using an RFID-enabled robot that counts inventory on the sales floor each day. Even though stock-taking with an RFID-enabled handheld device is much faster than a bar-code-based inventory count, "it is manual work that ties up capacities of staff," according to the company's head of IT. With the help of the robot, RFID-enabled counting can

be conducted more often to improve the accuracy of the inventory data and allow staff to focus on their core tasks of consulting and sales. Adler started the deployment of the robots in October 2015[1] and expanded its pilot to three more stores in 2016. Adler evaluates and analyzes the collected data and economic impact in 2017.

To illustrate the benefits, consider the example case of an item's having been stolen. Before the introduction of RFID technology, many of these cases could not be readily detected, so they led over time to a growing disparity between the store's theoretical and real inventory. With RFID and regular sweeps through the store, the inventory counts can be corrected, missing items can be detected earlier, and replacement orders can be made more accurately and timely, resulting in increased sales.

Increased process efficiency was achieved in the management of items. For example, the recording of incoming and outgoing items is now made in batches by packet, instead of having employees scan each individual barcode manually.

The process efficiency of full inventory counts also improved. The scanning speed of RFID sweeps beat that of manual scanning, so overall inventory accuracy has significantly improved using more regular sweeps. Full-inventory scans are still performed annually to verify the RFID accuracy and detect anomalies like destroyed tags.

Faster processing at points of sale. Faster processing at points of sale deserves separate discussion, although it also relates to the process-efficiency category. Efficiency at the points of sale are especially important, as customers must queue there in order to purchase their items. Studies have shown that waiting time impacts the perceived quality of service (Davis and Vollmann 1990), so speeding the point-of-sale process is more important than, for example, speeding the process of receiving items in the stockroom.

The speed-up in service at the points of sale was due to two changes in the process. First, the RFID tags allow the employee to batch-scan the customer's items instead of manually finding and scanning each item's bar code. Second, the manual step of removing hard tags is dropped with the introduction of RFID tags, which provide the EAS capabilities that the hard tags once provided. Consequently, the gain in efficiency at the points of sale results in lower queuing times and, thus, in *higher customer satisfaction*. In fact, most customers at the cash registers are amazed by the speed of item identification. The two most common questions the customers pose are: "Is that already the total amount?" and "Are you already done scanning everything?" (Adler Modemärkte AG 2015).

Source tagging and theft prevention by means of RFID technology. Instead of costly hard tags that were attached by suppliers and removed at the point of sale, lightweight and affordable RFID tags are mounted on each item's price tag. These tags and the tags sewn into garments allow for a broader coverage of article surveillance. More than 90% of the items at the Adler stores are equipped with

[1] http://www.rfidjournal.com/articles/view?14057/

RFID tags. In particular, the entire textile inventory is covered with this theft-preventing technology, in contrast to the costly hard tags that were used to secure only high-value items. The introduction of RFID technology clearly resulted in *reduced retail shrinkage*.

One of Adler's goals—improving the goods-reception process—was not completely achieved because of some of the suppliers' incomplete coverage of items with electronic product codes. Adler is currently working on this issue and will re-evaluate the potential for improvement when all of its suppliers have adopted the required tagging procedures. Meanwhile, this goal is excluded from the project's goals for evaluation purposes.

5 Lessons Learned

Realistic goals with respect to the expected benefits must be set when a company adopts a new technology. Otherwise, a bad impression remains even if the project succeeds despite its failure to meet overly optimistic goals.

There is often unreasonable hype around new technologies. RFID technology was hyped in the late 1990s (Sparks 1999), with all the promises and expected improvements of a new technology. Adler wisely resisted the urge to adopt RFID too early, when it was not yet economically feasible for the company with respect to its strategy, resources, and culture.

Once the decision to conduct the process improvement project was made, the support of specialists proved worthwhile, as did splitting the project into distinct phases with trailing evaluations, which helped to ensure that the project stayed on track.

Adopting a new technology requires not only economic feasibility and meticulous planning but also knowledge about the risks that are introduced with the new technology. For example, by thoughtlessly gathering unlimited (sensor) data in the current era of big data, we face potential privacy risks for employees and customers. To avoid this threat, Adler keeps its data in physically disconnected systems and participates in the SERAMIS research project, which researches privacy-related risks in this context.

When faced with process-related challenges in the course of an improvement project, companies must get their employees on board. To this end, it is better not to argue using the technology or its merits but to take a process-oriented view, where the technology is merely a means by which to achieve the process goals that will make their jobs easier. Process-improvement projects sometimes face reluctance or even outright rejection by the employees in large part because of cases in which employees have lost their jobs as a result of process improvements (Hammer and Champy 1993). For example, instead of telling employees that "we are adopting RFID to optimize our processes," make the goals and aims of the process improvement project transparent by asking employees, "How can we improve on the procurement of goods to prevent customers from being disappointed and moving

to competitors when they can't find the items they want? How can we ensure that goods are always in reach of our customers?"

To conclude, the adoption of RFID has paid off for Adler and will serve as a basis for further process optimizations, such as robots that automatically perform stock-taking.

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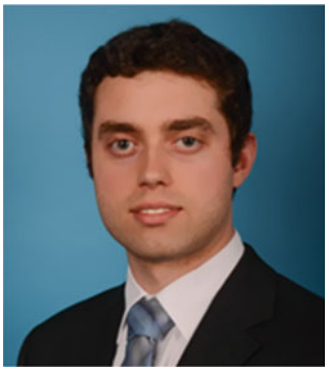

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