RFID in Retailing and Customer Relationship Management

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Abstract

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This paper investigates the opportunities of RFID to enhance B2C marketing of apparel retailers. The paper presents six out of 17 developed RFID applications that support relationship marketing of apparel retailers to better recruit, retain, and recover customers. The RFID applications are classified by the marketing goals they fulfill and the marketing phase they support. The authors describe the use of each RFID application exemplified, and evaluate the additional value for the customer company relationship as well as the feasibility for apparel retailers to implement the application into practice.

KEYWORDS: RFID, Auto-ID, item level tagging, apparel retail, relationship marketing

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I. INTRODUCTION

This paper examines how apparel retailers can benefit from RFID to improve their relationship marketing capabilities facing the current challenges in retailing.

Apparel is an important sector in the retail industry accounting for a worldwide market of $ 833.7 billion in 2004 and is predicted to reach $ 952.1 billion by 2009 [Datamonitor 2005]. However, the retail industry has to struggle with demanding challenges. Higher power of buyers, hyper competition and new technologies are the three most crucial issues [Chu and Morrison 2003]. Relationship marketing aims at dealing with these challenges putting the customer-company relationship in the center of all activities with a long term focus. In a close relationship customer needs can be better understood and faster addressed complying with the higher power of buyers. The long-term focus aiming at customer satisfaction and loyalty helps to avoid customer migration facing the hyper competition among retailers and finally leads to economic success [Bruhn 2001; Bruhn 2001].

The customer life-cycle concept as the central concept of relationship marketing describes the intensity of a relationship between the company and the customer over time and provides tools for each phase of the cycle to keep the customer satisfied. Three basic phases can be distinguished, focusing on different aspects of the relationship. Recruiting is the first step of initializing a new relationship. Afterward, the recruited customers have to be retained, or —in case they seem to quit the relationship—recovered [Meffert and Bruhn 2000].

Radio Frequency Identification (RFID) might not only have the ability to revolutionize the supply chain [Kuzeljevich 2005; Loebbecke 2005] with a focus on logistics, operations and supply chain management [Strüker and Sackmann 2004]. A recent study predicts "that the true benefits of RFID for retailers will be in enhanced marketing opportunities" [Sharpless 2005]. However, research on RFID for marketing purpose is still rare offering the need for more specific research on how RFID will impact business to consumer (B2C) marketing and services [Curtin, Kauffman et al. 2005].

First trials with RFID as a marketing technology enabled more customized services and shopping convenience and lead to higher customer satisfaction and loyalty [Berthiaume 2004; Loebbecke 2005]. This paper examines how RFID can be used as a lever to improve the effectiveness of relationship marketing tools along the customer life cycle and how to achieve the goals of relationship marketing in recruiting, retaining, and recovering customers.

II. RESEARCH APPROACH

The conducted research was a combination of secondary followed by primary research. We analyzed existing RFID pilots, technical challenges and potentials of RFID described in literature and subsequently conducted interviews with RFID experts to evaluate our findings. Finally we put the opportunities into the framework of relationship marketing.

Secondary Research to Collect RFID Applications

RFID in retail relationship marketing is quite a new topic in academia and therefore existing research on the usage of RFID in this area is limited. Existing publications imparted primal knowledge and insights on RFID for general marketing purpose [Doyle 2004; Jannasch and Spiekermann 2004; Wiedmann, Ludewig et al. 2005]. When talking about practical implementation challenges, especially the issue of privacy is covered intensely [Spiekermann and Ziekow 2004; Majoras, Swindle et al. 2005] and technical problems are highlighted. However, some RFID pilots have been already conducted in apparel retailing and thus acted as a first base for developing 17 RFID applications.

Exploratory Research to Evaluate RFID Applications

In order to deliver a balanced and realistic view, it was inevitable to ask for expert opinion via an exploratory study to revise and evaluate the identified RFID applications from the secondary research with respect to the peculiarities of the apparel retail business [Schnell, Hill et al. 1999]. Approached interview candidates were marketing and IT experts from apparel retailers as well as designated RFID specialists. Starting point was a top-20 list of German apparel retailers [Kreimer 2005]. The 16 interviewed companies can be classified either as discounters (four companies) delivering goods at competitive prices, fashion and department stores (nine companies) providing a big variety of different types and brands of clothes, and specialty stores or boutiques (three companies) that focus on a specific apparel segment or only trade their one brand often at premium prices (Table 1). The personal interviews

were conducted either face to face or by telephone in spring 2006 and lasted around one hour following a preset and pretested guideline.

The Interview Guideline Covered Two Areas

The first part of the interview covered the general attitude of the company toward RFID (Figure 1). The status quo of RFID research within the company including possible tests and implementations as well as challenges of implementing RFID got discussed. Also the plans about how to proceed and deal with the technology in the near future have been asked for.

The second part tackled the opportunities of RFID for retail relationship marketing. The execution of this part was dependent on the interviewee's expertise to go into details of RFID applications. After the first rough estimation of the potentials of RFID for marketing purposes by the interviewee, relevant RFID applications from the secondary research have been discussed together regarding the potential value and feasibility for the apparel retailer.
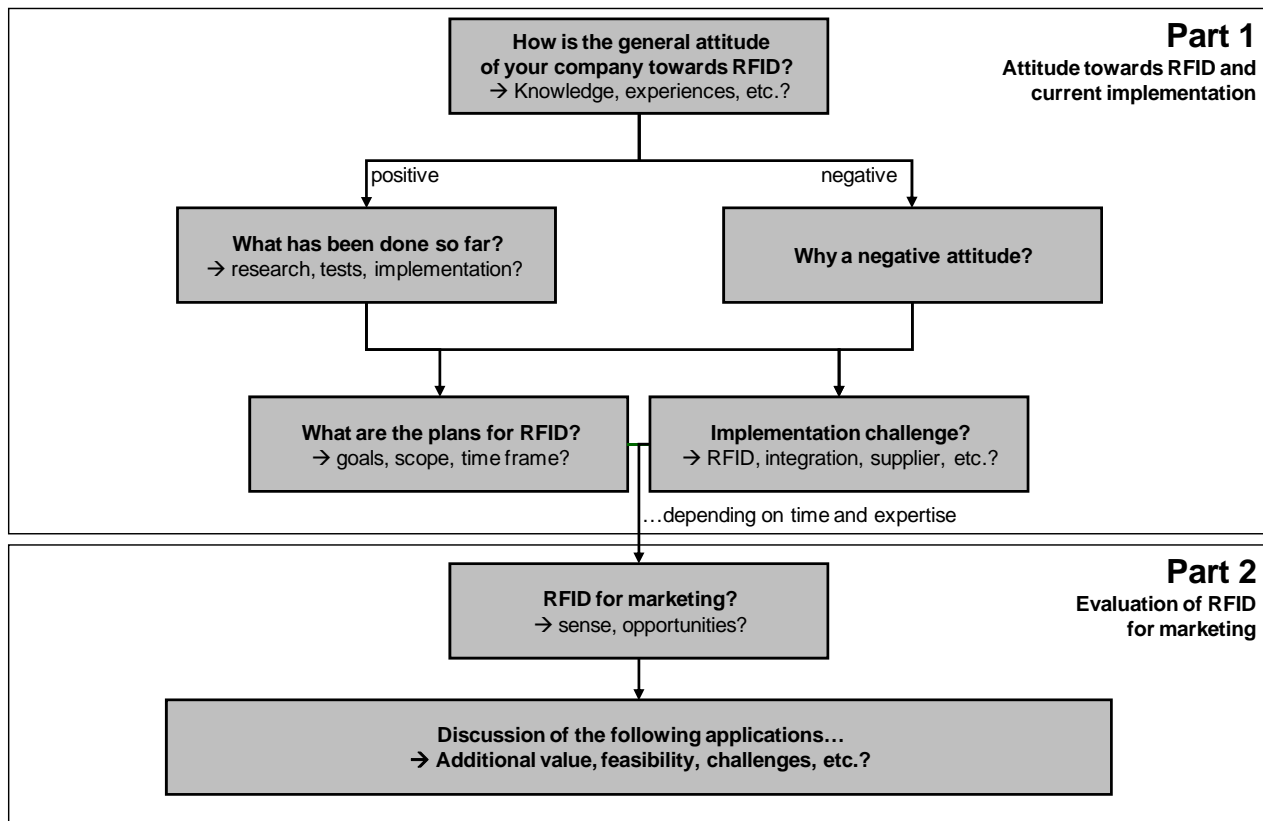

Figure 1. Interview Guideline (Own Representation)

III. INTERVIEW RESULTS: ATTITUDE TOWARD RFID AND CURRENT IMPLEMENTATION

General Attitude of Apparel Retailers toward RFID

In the interviews different attitudes toward RFID have been encountered. Some retailers just seemed to have been waiting for this research study to be conducted in order to have a high quality discussion on that topic. Others mentioned that RFID is not interesting at all for them and do not put effort in it in order to handle more urgent issues. The answers from the different interviewees were repeating and thus clustered into three groups:

Group 1: The "Not-Interested-at-all-in-RFID" Apparel Retailers

Seven of the interviewed apparel retailers (Interview 2006bceklor) do not see RFID as a topic at all for the moment. Therefore RFID has a very low priority within their companies and no specific research or tests have been done. Most information about RFID is from trade press. As they say, they do not a see a benefit from the technology for their company. However, they partly admitted that they do not know too much about RFID and its potentials.

Group 1 has no plans about RFID for the near future. They will just wait and see what happens in the market without specifically having RFID on the radar. They will focus on other innovations instead that seem more promising to

realize quick wins for them. For the case RFID will unexpectedly gain importance they will go for a fast follower strategy, "after the driving players have prepared the market for RFID."

Table 1. Overview of Interviewed Companies (Own Representation)				
Group	**Interview**	**Company**	**Coverage**	**Experts**
Group 1:				
Not interested	2006k	Boutique	Part 1	1 (IT)
Not interested	2006o	Boutique	Part 1 & 2	1 (Marketing)
Not interested	2006r	Boutique	Part 1	1 (Marketing)
Not interested	2006l	Discounter	Part 1	1 (Marketing)
Not interested	2006b	Fashion store	Part 1	1 (IT)
Not interested	2006c	Fashion store	Part 1	1 (IT)
Not interested	2006e	Fashion store	Part 1	1 (IT)
Group 2:				
Aware	2006a	Discounter	Part 1 & 2	2 (Marketing & IT)
Aware	2006h	Discounter	Part 1	1 (IT)
Aware	2006n	Discounter	Part 1	1 (Logistics)
Aware	2006j	Fashion store	Part 1 & 2	1 (IT)
Aware	2006m	Fashion store	Part 1 & 2	2 (Logistics; marketing)
Aware	2006q	Fashion store	Part 1 & 2	1 (Logistics)
Group 3:				
Active	2006d	Fashion store	Part 1 & 2	1 (IT)
Active	2006g	Fashion store	Part 1 & 2	1 (Logistics)
Active	2006i	Fashion store	Part 1 & 2	2 (Logistics, Consultant)
Other:				
	2006p	Consultant	General	1 (Apparel retailing)
	2006s	Metro Group	General	1 (CIO)

Group 2: The "RFID-Aware" Apparel Retailers

Six retailers (Interview 2006ahjmnq) see RFID as a very interesting new technology. They see potential benefits and therefore also got involved with RFID. Information sources used are RFID initiatives like the GS1[1] or EPC[2] organization and discussions with consultants. Design fairs, conversations with RFID suppliers and all kind of trade press get analyzed. Some started serious business case calculations evaluating the cost saving potentials in quantitative examinations. Due to high tag costs their business case calculations have not been convincing so they are now in a wait and see situation until important parameters of their calculations change. Also they wait for technical problems to be solved before real implementations and tests. But also the market does not yet seem to be ripe they claim. Convincing suppliers to use EAN codes still is troublesome in many cases. "Forcing" them to use RFID could overstrain the business relations. Nevertheless, missing money and manpower for expensive RFID trials is also an issue especially for the smaller companies.

For the future, group 2 continues to actively observe the market, doing more business cases if important parameters change. For example reusable RFID tags are taken into consideration or new potentials like merging RFID and electronic article surveillance into one device are evaluated in the benefit-costs analyses. If investments into new supply chain technology are about to be made those RFID-aware retailers take RFID requirements into consideration. For example, one recently updated his cloth sorting system and decided for an approach that uses barcodes today but allows to easily shifting to RFID when the time is ripe. Another retailer will start to slowly migrate to RFID on case level by 2007. One apparel retailer is seriously considering starting first pilot tests soon. However, most of those retailers are not pushing the implementation to a degree that will speed up the process of getting RFID into the stores. They are just doing a bit more than the minimum to be up to date.

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[1] GS1 is an organization helping to design and implement global standards and solutions to improve the efficiency and visibility of supply and demand chains [GS1 (2006). "The global language of business." Retrieved May 19, 2006, from http://www.gs1.org/.].

[2] EPCglobal is a subscriber-driven organization comprised of industry leaders and organisations engaged in the development of industry-driven standards for the Electronic Product Code [EPCglobal. (2006). "Home Page." Retrieved May 19, 2006, from http://www.epcglobalinc.org/.].

Group 3: The "RFID-Active" Apparel Retailers

Those three companies (Interview 2006dgi) are highly interested in the technology and consider RFID as a major and important topic. On the one hand they see the potential benefits of the technology itself but on the other hand they also see it as a means for publicity. They either already conducted first technical feasibility studies and experimented with RFID for different purposes, or they are active members in the previously mentioned organizations GS1 and EPC. Furthermore they have dedicated RFID experts and actively participate in RFID discussions.

Group 3 is the driving force for the future. Having already collected own experience with RFID or closely observed RFID pilots they plan first implementations in different scales. Two (Interview 2006di) think about starting with supply chain logistics on case level and one plans first implementations on item level (Interview 2006g).

Correlation between the Retail Format and the Attitude toward RFID

Group 3 consists solely of big retail chains and no discounters. This makes sense as discounters do not focus on customer service due to their strategy and their low margins. The boutiques are all in the not-interested-at-all group (group 1). A possible explanation could be the related high expenditures colliding with the limited financial resources and restricted bargaining power over suppliers of those smaller retailers.

RFID for Marketing Is Considered Very Differently

Most of the RFID-active retailers (group 2) did not consider revenue increasing potentials of RFID due to marketing potentials into their quantitative analyses. Compared to group 1 where retailers in some cases did not even see any relation between RFID and marketing at all, group 2 at least sometimes took marketing aspects concurrently into account. However when calculating cost saving potentials they did not include revenue increases due to RFID. Therefore the listing and classification of RFID applications in this chapter for retail relationship marketing will help those companies to systematically investigate what marketing applications are relevant to them and subsequently financially evaluate them.

The Reasons to Ignore Marketing Potentials of RFID Were Diverse

Retailers (Interview 2006aiq) are missing the "killer application" to justify RFID at the customer front or do not see any application at all (Interview 2006e). Furthermore the benefits are very hard to quantify (Interview 2006di) and therefore investment decisions even harder to justify. Also RFID is seen as a second step. Before thinking about RFID, IT systems first need to be integrated and customer cards be introduced (Interview 2006hnqr). Retailers are also afraid of customer acceptance and privacy concerns (Interview 2006amno). Elderly people for example may not be tech-savvy enough to cope with that new technology (Interview 2006m). Male shoppers may not be willing to spend additional time on fancy applications than the minimum necessary for the purchase (Interview 2006o). Discounters do not see a need for improving customer service and premium brands do not want to substitute the human being as the main contact person by technology.

The Major Reasons to Focus on Marketing Are Differentiation and Customer Orientation

Finally, RFID for marketing is a new opportunity to differentiate the company from competitors and to survive in today's economical conditions. One retailer argues that RFID for logistics is not the major point. The focus in their research today lies in the customer. "Process efficiency potential does exist but is restricted. However, the problem in retailing today is not process efficiency, it is about demand. Higher competition and a reduction in spending power of consumers lead to shrinking revenues" (Interview 2006g). Customers shopping for apparel show a much more active shopping behavior than shopping for food or other convenience goods. Thus RFID to improve customer service can have a major impact on customer satisfaction and positively influence the shopping habit (Interview 2006i).

## IV. INTERVIEW RESULTS: EVALUATION OF RFID FOR MARKETING

In part two of the interviews, the developed RFID applications were discussed with the apparel retailing experts following the customer life cycle—the central concept of relationship marketing (Figure 2). Relationship marketing aims at improving the economical success of a company through better customer satisfaction, loyalty, and retention. This can only be achieved if the customer gets treated right in every phase of his relationship with the company.

RFID Applications Are Classified by the Marketing Goals of the Customer Life Cycle

Each phase of the customer life cycle has specific goals. The recruiting phase consists of three. First, the retailer has to **persuade** the customer that he can best satisfy his needs, even better than all competitors, in order to make a market. Then he must **stimulate** the customer to actually demand the company offer and start spending money.

Subsequently the retailer should **familiarize** the customer with his offer to build the first step of long-term retention. Six RFID applications fall into this stage.
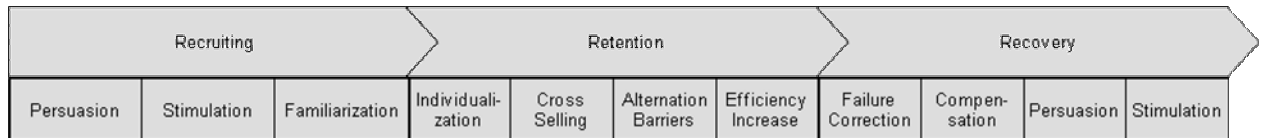
Figure 2. Scheme for Describing RFID Applications (Own Representation)

In the phase of customer retention, **individualized offers** help to tie the customer to the company. **Cross and up selling** increases revenues and profits and the implementation of **alternation barriers** shall hinder the customer to try out offers from competitors. After all, the **efficiency** in handling the company customer relationship should be increased to lower transaction costs and provide resources for other customers. Most (eight) RFID applications belong to this active phase of the relationship.

For the case the customer is about to quit the relationship, the retailer must **correct possible failures** in the relationship and product offering that might have cause dissatisfaction. Furthermore the customer needs to be **compensated for all inconvenience caused**. Having done that, the company again needs to **persuade and stimulate the customer to recover** him. Three RFID applications were developed to foster the recovery.

Table 2 shows 17 RFID applications that were discusses in interviews and may help a company to improve its capabilities to actively influence the customer life cycle in a way to improve customer satisfaction and thus prolong the customer life cycle increasing word of mouth, buying frequency, and buying volume. In the following, only the six applications regarded by the experts as most valuable and feasible (marked in grey) will be presented in detail and show the potential of RFID to increase the effectiveness of relationship marketing.

Table 2. Overview on RFID Applications (Own Representation)				
Phase	**Marketing Goal**	**RFID application**	**Value**	**Feasibility**
Recruiting	Persuasion	Signaling high Service capability	+	++
	Persuasion	Authenticity assurance	-	++
	Stimulation	Dynamic pricing	O	-
	Familiarization	Location service	O	O
	Familiarization	(1) One face to the customer	+	++
	Familiarization	(2) Info terminals	+	+
Retention	Individualization	(3) Interactive advert displays	+	+
	Individualization	Running patterns	++	O
	Individualization	Measurement data storage	--	++
	Individualization	(4) Individual pricing	+	O
	Individualization	(5) Value added services	++	+
	Cross selling	(6) Recommendation system	++	+
	Alternation barrier	Technical alternation barrier	+	O
	Efficiency increase	Faster check out process	+	++
Recovery	Failure correction	Product recall	--	-
	Compensation	Easier product trial	O	++
	Stimulation	Intelligent wardrobe	+	--

RFID Application 1: One Face to the Customer

A constant contact person helps to familiarize the customer.

In today's big stores with many sales persons, customers most probably have random contact to different employees determined by coincidence. This anticipates the building of a trust relationship with one constant contact person. Customers carrying an RFID customer card can be identified when entering the store (IDTechEx 2004). The information about their arrival can be used to notify a corresponding sales person who for example initiated the last purchase or was responsible for the customer to sign up for the customer card. Or if customers have a favorite sales person, the corresponding employee can be called up [RFID Journal 2002].

RFID customer cards allow for identifying the customer when entering the store.

Customer cards already exist today and are used since several years as an instrument for customer retention [Strüker 2006]. With the existing cards, the identification takes place right before leaving the store at the cashier (Interview 2006a). RFID allows for identifying the customer at the beginning of his stay in the shop and therefore allows to personally approaching the customer by name during his whole stay. The needed infrastructure is very primitive as the same gates that are used for theft protection of RFID tagged apparel can be used and customer cards just need to be equipped with a tag. Thus the technical entrance barrier is relatively low, which is not the case for the psychological barrier.

Evaluation: Customer privacy versus better service

Customers might feel spied out and could see their privacy being endangered making this application awkward (Interview 2006a). Therefore, three (Interview 2006adg) of the seven interviewed apparel retailers are skeptical regarding the value of this RFID application not only due to privacy concerns. Another question is whether the customer really always wants to have the same sales person at every purchase (Interview 2006g). Maybe he is very dissatisfied with him or her. This would require making the selection of a corresponding contact person a voluntary option (Interview 2006m). The other four interviewees (Interview 2006ijmo) expect a big additional value especially for VIP customers.

RFID Application 2: Information Terminals

Customers want to ask questions to sales persons.

A recent study asking 2,500 consumers in Europe about their buying behavior revealed that the third most common reason for dissatisfaction is the missing opportunity to ask questions to sales persons [Cap Gemini Ernst and Young, Intel et al. 2003]. Sales staff is often occupied with shelf refilling and bringing back misplaced items. Due to cost cutting, shops are often understaffed and sales associates neither skilled nor trained enough to well answer customer questions (Interview 2006p). However, the availability of a customer service desk is important for the familiarization of the customer with the company [Bruhn 2001]. RFID can help in an indirect and a direct way to provide better customer service and subsequently satisfaction.

A) RFID frees employees' time and allows them to better serve customer questions.

RFID can help to faster locate misplaced items and allows for better shelf replenishment. As a result sales associated get supported in their operative store work and will have more time to deal with customers.

B) RFID offers a new information channel to customers substituting staff.

Presentation terminals or displays around the shop can be used for customer information triggered by RFID tagged items [Jones, Clarke-Hill et al. 2004]. Those terminals can, to some degree, be an alternative to the communication with sales personnel, and in any case they are an interesting complement. Information about the materials composing the apparel or the supply chain the product went through can be accessed and special features can be highlighted [NCR 2003].

RFID allows for more and current information about the product than the packaging: Instead of printing a new package for a product that just recently received a quality seal, the additional information can just be altered into the database. As for the case of apparel most items do not even have a dedicated packaging. The small label inside the clothes is the only space for such information with only restricted advertisement effect.

The devices to enable this kind of communication can be displays that put the information up on a screen when the product gets removed from the shelf. This is already being tested in the Metro Extra Future Store. "When a tagged shampoo bottle is lifted from the shelf, it activates the display screen above the shelf starting a commercial advert or communication tailored to that product" [Wilding and Delgado 2004]. Prada used the same principle to show a video

clip of a model wearing the specific apparel on a cat walk [Ideo 2001]. Information terminals can also be set up in the store or the fitting rooms so that customers can hold their clothes upfront to access the features.

All of the six interviewed retailers [Interview 2006adgijo) see an additional value of this RFID application. To some degree, those information terminals can be technically already realized today with barcodes (Interview 2006a). However, RFID would ease the use for customers dramatically as there is no need to search for the barcode label on a hang tag and hold it in front of the scanner (Interview 2006j). Nevertheless, information terminals and displays would be an immense investment of around 50 to 60 thousand Euros for around 20 screens per shop and their return on investment is questionable (Interview 2006a). A major problem is also the effort of keeping the databases that handle the product information and features up to date. This could be outsourced to the manufacturer and costs could be shared. For example in department stores, such an information screen is a perfect way for manufacturers with their store-in-store isles to catch customers' attention and differentiate from competitors. Especially functional wear could benefit of this effective way to highlight special features. One manufacturer of highly functional wear for example has the problem that customers sneak around the shelves comparing prices without realizing differences in functionality. For this manufacturer, RFID triggered screens could inform the customers about the special functions that justify higher price (Interview 2006g).

RFID Application 3: Interactive Advertisement Displays

Individualized and interactive communication is more successful than passive.

An important aspect of retention is the individualization of the company's offering to the customer needs [Bruhn 2001). Individualized customer interaction such as in direct marketing is a recent strategy trend for this in marketing [Wiedmann, Ludewig et al. 2005] and can be achieved at the point of sale. To realize interactive communicating point-of-sales systems, information like age, gender or buying behavior about the dialog partner is required [Sieben 2003]. In brick-and-mortar retail shops customers get identified, and therefore can be treated individually, as late as at the cashier when showing their customer card. At that time, buying decisions have already been made [Strüker 2006]. With RFID equipped customer loyalty cards or "a tag embedded in a shoe could serve as an identifier of the person wearing it" instead, customers can get identified already while shopping [Rodkin and Yanahan 2005]. Their personal buying history can be accessed unleashing relevant information for individualization.

RFID enables the integration of customer specifics into the communication.

Warnings about product contents which a shopper is allergic to or wants to avoid can by shown at information terminals or using any other RFID device such as cell phones [NCR 2003]. Individual prices or special warranties for frequent shoppers for example can be communicated exclusively. Birthday specials or suggestions based on the shopping history can be made, and depending on the age of the customer different product features can be highlighted. The system can also suggest outfits based on a short touch screen query revealing that the customer is currently looking for a diner outfit.

RFID can integrate the customer into advertisements.

A possible enhancement is the integration of the customer into advertisement. Land's End, a U.S.-based apparel catalogue retailer, offers since 1999 the "My Virtual ModelTM" in its Internet shop. Customers can create a personal, three-dimensional model of themselves based on their body measures. They can choose among several faces and hair cuts. After having created this personal model, customers can virtually try on apparel to get an impression about the fit and see how the colors of the outfit match [Uhrich and Müller 2006]. RFID can merge electronic commerce technology into brick-and-mortar shops. Using a 3D body scanner such as the German apparel retailer C&A already offers in its store in Hamburg [C&A 2001] or a simple tape measure can reveal the needed body measures. A customer profile can then be stored onto the customer card or linked to a database. If then standing in front of a shelf, the virtual model of the customer wearing the clothes can give a personalized fashion show on a screen. This catches the customer's attention and can convince him or her of apparel he or she normally would not even have taken off the shelf. Shopping convenience grows as customers can save time for fitting on clothes that do not match their style or will not fit them as they can see on the screen (Interview 2006d). Especially for made to measure clothes or customizations of standard clothes this can be a powerful means (Interview 2006j). Nevertheless, the technical challenge of implementing such a system seems big (Interview 2006a) and the additional value for the customer despite its function as an eye catcher needs to be further evaluated (Interview 2006o).

Evaluation: Apparel retailers appreciate the new opportunities.

In the interviews, all five apparel retailers (Interview 2006adijo) positively reacted to the benefit of RFID enabling more interactive communication. However, depending on the degree of customer integration, privacy is an issue as individual prices or special warranties should not be readable by other customers (Interview 2006j). Therefore, cell

phones or screens in the fitting rooms should be preferred for critical information to displays at shelves. Also different customer groups will have a different acceptance of the technology. Women or elderly people might be less tech-savvy in using interactive touch screen systems.

RFID Application 4: Individual Pricing

Short-term pricing focuses on single transactions versus long-term relationships.

Price measures for short-term buying stimulation equally change prices for all customers and focus on a demand increase for a single transaction. However, every customer has an individual willingness to pay. In the long term, as the customer company relationship lasts on, this willingness to pay can be explored, and adequate long-term price stimulations like individual quantity rebates or customized bundles matching the personal buying history can be provided. Those long term measures focus on establishing and strengthening a relationship with several transactions [Bruhn 2001].

RFID enables price individualization based on the individual customer lifetime value.

RFID customer cards allow to fast and easily track the buying history of customers. This information can be used to estimate a so-called "customer lifetime value"[3] (CLV) describing the future revenue potential and therefore importance of a customer for a company. With the CLV, customers can be clustered into several groups based on their actual and potential future attractiveness. This helps identifying endangered customers with decreasing shopping habits or premium customers creating extraordinary high revenues. Depending on this classification, pricing measures can be applied individually to anticipate customer revenue decrease by stimulation discounts, or reward premium shoppers with quantity rebates. First-time buyers can be stimulated with lower prices [NCR 2003] and customers showing little price sensitivity in the analysis of their purchase history (no reaction to discounted items, preference of premium apparel) can be charged premiums [Helm and Günter 2003].

RFID identifies customers while shopping and not as late as at the cashier.

In contrast to classical loyalty cards, RFID customer cards allow to identify and communicate with customers already during their time in the shop and not until the cashier when about to leave. Thus the effect of pricing can directly influence the purchase. Interactive advertisement screens in the shop can communicate individualized messages to the person standing in front. RFID-enabled cell phones or "personal shopping assistants"[4] can be used for scanning items and displaying price information while maintaining privacy. The same applies for price mirrors, information terminals in the shop or info screens within the fitting room.

Evaluation: RFID improves the window of opportunity for individual pricing.

Still, individual pricing is questionable due to legal regulations and ethical issues lowering the market transparency [Pepels 2001] and therefore is a strategic decision. Different prices for different customers endanger the feeling of price justice or price equity which can lead to unsatisfied customers [Bruhn 2004]. From the six interviewed retailers (Interview 2006adgjio), one completely despises pricing measures as not being compatible with the company's strategy (Interview 2006o), and two (Interview 2006ag) see somewhat an additional value as they prefer to use such price discounts as snail mails to allure customers to the shop. The other three see a big additional value due to the fact that customers can be approached while shopping.

RFID Application 5: Value Added Services

RFID can improve existing value added services as a better Auto-ID technology.

Customers fitting their clothes often realize that they have picked the wrong sizes or colors. This means they have to dress again, leave the fitting room with the risk of queuing up afterward, search for the desired item, and come back to continue fitting. Many apparel customers "are not shy about directing store associates to search the backroom if required" [Kurt Salmon Associates 2005]. Hence, it can also mean that retailers offer this task as a special service. However, such service is very personnel intense and therefore costly. Sales associates need to look for the desired apparel themselves, check if it is on stock and finally locate it (it might be misplaced somewhere in the shop, in another fitting room or in the stock room). RFID here offers especially in the apparel business big benefits for item

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[3] The „customer lifetime value" (CLV) is a marketing measurement for the quality of customer relationships over time. For further information refer to [Bruhn, M. (2001). *Relationship Marketing*. München, Vahlen.].

[4] The Metro Extra Future Store uses a multimedia device called "Personal Shopping Assistant" (PSA), attached to the shopping cart to interactively communicate with customers [Strüker, J. and S. Sackmann (2004). *Success Factors for Electronic Customer Communication in Brick-and-Mortar Retailing*.]. For apparel retailing a portable "Personal Digital Assistant" (PDA) could have similar functionality.

location to quicker find the appropriate apparel [Kurt Salmon Associates 2005]. Thus personnel costs get manageable.

RFID acts as a life-long sales slip for return, post work services, or care instructions.

An RFID tag embedded in the apparel acts as a life-long sales slip and makes the conservation of a paper ticket obsolete. Retailers often offer post work customization service free of charge or at reasonable prices to their customers. To prove that the apparel has been bought at that retailer, the original sales slip is needed. However, if a customer can not provide the sales slip, apparel retailers "in dubio pro reo" still provide their service for free as misuse is quite low. One retailer estimates the rate of misuse to be at around 0.3 percent (Interview 2006m). Nevertheless, not having to keep the sales slip for post work, warranty issues or 14 day test purchase and product return means more convenience for customers. Also care instructions saved on the tag can be useful for customers. Often the paper with the instructions is itchy and gets cut off by customers (Interview 2006g). In the future, RFID tags could contain this information to be read directly by the washing machine for automatically determining the right settings.

RFID offers a new differentiation source for retailers with cooperation partners.

With RFID tags embedded in apparel it is possible to relate apparel to the retailer who traded it. A retailer can offer value added services in cooperation with external partners. Those service contractors can use RFID for the verification of the apparel and for billing with the retailer. Thus, RFID can be used by any apparel retailer to differentiate himself from other retailers selling the same apparel. Today, retailers differentiate themselves mainly by their geographic distribution, their shop design and service as well as their price points. With RFID, retailers can differentiate themselves much more with value added services. Cross company value added service offers could be cleaning, maintenance, or repair services for the sold apparel. The retailer negotiates contracts with service providers such as Laundromats or tailors to offer special prices on their items. Subsequently, retailer A can justify a higher price for the same apparel that retailer B sells due to value added services related to the retailer and not the product. This offers a new source of differentiation and competitive advantage for dealers trading standardized products.

Evaluation: Apparel retailers are excited about this new opportunity.

In the interviews, all four apparel retailers have been excited about this new opportunity (Interview 2006ijno). It offers a new way to differentiate from competitors and provide additional value to customers. Especially smaller or specialty retailers may profit the most from this opportunity.

RFID Application 6: Recommendation Systems

Cross selling to increase revenues per customer

Besides individualization, cross selling is necessary for an economical growth of the relationship by increasing the revenue per customer. Higher buying frequency and higher buying quantities are the result [Bruhn 2001]. RFID can be used to individually promote related products and improve cross selling [Jones, Clarke-Hill et al. 2004] [Wiedmann, Ludewig et al. 2005]. Retailers can "communicate with shoppers while they are shopping in an effort to encourage them to buy an additional and/or complimentary item" [Rodkin and Yanahan 2005]. In the Metro Extra Future Store for example information terminals offer computerized cross selling suggestions for wine pairing which 64 percent of the respondents in a study conducted by the Boston Consulting Group ranked as highly valuable [Rodkin and Yanahan 2005].

RFID readers and multimedia screens in the fitting rooms for computerized suggestions

For apparel retailers, merchandising multimedia systems can be used in the fitting rooms for instance. "A reader in the dressing room identifies all items a customer brings inside, and a large display shows multimedia product information along with suggestions for alternative or complementary combinations of clothing and accessories" [IDTechEx 2005].

Cross selling recommendations can be based on various information sources.

"Tracking customers' purchases before they leave the store offers retailers information that can immediately be used for the cross selling other related products" [Rodkin and Yanahan 2005]. Thus product suggestions can be made based on the current assortment of apparel brought to the fitting room and the long term buying history of the shopper. In both cases, recommendations can derive either from a company's perspective suggesting bad selling clothes or remaining single copies, or from a customer's point of view suggesting apparel that most likely fits his taste. What clothes match together must either be determined manually by the retailer, or data mining and computerized recommendation algorithms like association analysis ("customers who bought product A and B also

bought product C") can do the job automatically [Grob and Bensberg 1999]. In analyzing buying patterns of several customer groups, shoppers with a corresponding pattern and thus fashion taste can be identified. Comparing previous purchases of those corresponding groups can reveal items that might be someone's taste but have not been bought yet. Those items can then be suggested via the multimedia screen. For the case the customer wants to try one of the suggested items on, there should be a bring service through a sales associate if clicking on a button (Interview 2006g). Therefore it is important to link the recommendation system with the existing information system to check product availability (Interview 2006a).

Evaluation: Cross selling might be a killer application with direct impact on sales.

All interview partners (Interview 2006ijgo) agreed that if applied correctly, this can be a real killer application. However, they see major efforts in manually determining the recommendation suggestion (Interview 2006aj). Therefore computerized algorithms would be preferred.

V. INSIGHTS AND IMPLICATIONS

Table 3 gives an overview on the selected RFID applications and highlights the main insights from the interviews concerning situations where these applications have the biggest impact:

Table 3: RFID Applications	
RFID application	**Situations with highest benefit**
(1) One face to the customer	Stores selling products with a high need for explanation and slow repurchase cycles such as workwear or liveries
(2) Info terminals	Retailers trading products with special features such as functional sports wear
(3) Interactive advert displays	Shops with a young, tech-savvy customer group
(4) Individual pricing	Retailers selling products to a big but less definable target group
(5) Value added services	Stores positioned in the medium to high price segment with a clear quality and differentiation strategy instead of cost and price leadership
(6) Recommendation system	Cross selling is highly valuable for almost every situation

Three Benefit Types of the RFID Applications

From the discussions with the apparel retailers none of the identified RFID applications seems to be the one and best "killer application." Different applications have different impacts:

- **Cost saving** in a customer relationship can be achieved via "information terminals" (RFID application 2) and a "faster check out process." Both applications aim at the **substitution of staff by technology** and thus help save costs.
- The following RFID applications focus on **increasing revenues per customer**. "Dynamic pricing" and "Individual pricing" (RFID application 4) try to exploit the individual **willingness to pay**. "Interactive advert displays" (RFID application 3) and "recommendation systems" (RFID application 6) make customers buy further products besides what was planned enabling cross selling and lead to a higher **quantity** of products purchased. Also optimized store layouts due to RFID enabled customer "running patterns" helps to place merchandise on the right spots leading to more sales. "Easier product trial" and an "intelligent wardrobe" have the goal to increase the **buying frequency** and thus also increase revenues per customer. Similarly, "technical alternation barriers" hinder the churn of customers to competitors and thus also keeps up buying frequency for the retailer.
- **Service quality** is perceived high if customers **trust** their retailer. "Authenticity assurance," more "advanced product recalls" and the "signalling of high service quality" make customers trust in the retail brand. This improves the likeliness of customers to buy at the specific retailer. "Value added services" (RFID application 5) and "location services" as well as "one face to the customer" (RFID application 1) deliver a better **shopping experience** to customers. Thus customers are more likely to spend much time in the shop and come back regularly for enjoyment. The "storage of measurement data" into the apparel underlines this individual experience.

RFID Migration Paths Vary by Retail Format and so Do the Benefits of RFID Applications

Consultants of Kurt Salmon and Associated say that the RFID migration path is dependent on the retail format [Kurt Salmon Associates 2005]. Different kinds of retailers can be distinguished based on the product category (assortment depth and width) and the customer benefit (price versus convenience) they provide [Nieschlag, Dichtl et al. 2002]. The way the different kind of stores will adopt RFID is not the same. Item level RFID tagging offers the full width of benefits, but tagging and data handling costs are much higher than RFID at the pallet or case level [Asif and Mandviwalla 2005]. Therefore RFID adoption can have different migration paths depending on the retail format (see Figure 3):
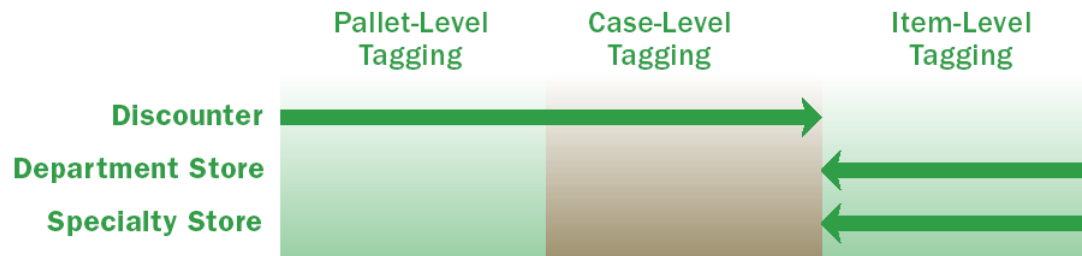
Figure 3. Migration Path of RFID Adoption by Retail Format [Kurt Salmon Associates 2005].

– **Specialty retailers** focus on one product category but provide unique expertise in this area to their customers. They are perfectly suited to capitalize on item level RFID. Starting to introduce RFID on high priority products and moving on to the rest of their assortment lowers the entrance barrier. Furthermore, customers can be better adducted to the new technology if starting on selected products (Interview 2006g). The store design, staffing model and price points of specialty retailers enable this step-by-step approach. "A store associate can effortlessly wave a handheld reader in the vicinity of specified store fixtures once or twice per day" [Kurt Salmon Associates 2005]. The staffing model is organized for long-term relationships due to the required product expertise. Therefore training on the use of RFID equipment is more effective. Furthermore, price points in specialty retailing are higher than in discount stores and subsequently cover the costs of item level RFID tags easier [Kurt Salmon Associates 2005]. For specialty retailers RFID could be mainly used for disburdening staff from operative tasks in order to free time for customer support which is very important for this retail type (Interview 2006o). The following RFID applications seem to be especially valuable: (1) One face to the customer fosters the personal relationship.

– **Department stores** offer a big variety of different product categories. Depending on the assortment depth within each product category they may follow the approach of specialty retailers to start RFID on the item level. Though, they will probably start with a whole product category (Kurt Salmon Associates 2005). For department stores, RFID could focus on more differentiation from competitors as many department stores sell the same apparel brands (Interview 2006o). The following applications could be most valuable: (3) interactive advert screens are a differentiator and lead to shopping experience. (4) Individual pricing rewards customer loyalty. (5) Value added services lead to more differentiation from competitors. (6) Recommendation systems are good for the big available product assortment.

– **Discounters** instead are better suited for a different RFID migration path. Using their bargaining power over suppliers they can force them to deliver RFID for all categories. Their low price margins, the multi-category nature of their stores and their lean staffing models make item level RFID tagging as an entrance in to the Auto-ID technology unattractive. However, the high volume of sell-through allows "these retailers to use intelligent algorithms to trigger out-of-stock" already with pallet and case level tagging [Kurt Salmon Associates 2005]. With falling tag prices they will move on to item level tagging in the future. Item level RFID tagging for discounter would especially lead to improvements due to substituting staff, and achieving more shopping efficiency (Interview 2006o). Therefore the following applications are recommended: (2) Information terminals can replace staff. (6) Recommendation system can replace staff.

In Five Years First Apparel Retailers Will Have Implemented RFID for Marketing

The interviews with apparel retail RFID experts regarding the implementation time frame split up interviewees into two clusters. Group 1 and 2 have no concrete plans about the implementation and also no idea about a time frame. Group 3 predicts to possibly start with RFID for marketing purpose in Europe by next year. In five years, the implementation will have been successfully finished and marketing potentials been realized (Interview 2006g).

Implementation of barcodes took such a long time as the introduction took place when retailing was booming. Today, retailing has severe profitability problems leading to a higher innovation pressure (Interview 2006g).

Practical Implications: Next Steps for Apparel Retailers

For apparel retailers interested in the adoption of RFID the following recommendation can be given from the authors' expertise:

- A start with item-level tagging is most suitable for high-margin products. It is not necessary to equip all apparel with RFID tags to participate at the first benefits of RFID. High-margin products absorb the (currently) high prices of the tags and already enable impressive applications. Also products from current advertising campaigns should be tagged as they have a key role pulling customers into the stores.
- Multimedia terminals should be placed as eye catchers close to the RFID tagged merchandise catching customers' attention. The multimedia terminals should provide additional information about the special features of the apparel (RFID application 2) and furthermore enable interactive advertisment (RFID application 3).
- One RFID recommendation systems should be placed in the changing rooms' area. Customers get matching product recommendations right when they try on tagged apparel. High-margin and advertised products thus act as multipliers to cross-sell other merchandise—even without RFID tags.
- Later on, as tag prices decrease further and first experiences have been made, tagging should be extended to other product lines and so should grow the infrastructure of readers and terminals allowing for the other RFID applications.

VI. FUTURE OUTLOOK

The Paper Can Be Used a Starting Point for a Financial Quantification by Apparel Retailers

The value of a research like this lies in the systematization of new, innovative applications, and the evaluation of the technical progress which is an integral step before real-world implementations [Strüker 2006]. The uniqueness of the research lies on the one hand in the approach of identifying RFID applications starting from a marketing perspective instead of the technology, and on the other hand in the close linkage of academia and practice. The paper can be used by apparel retailers as a framework to systematically evaluate the marketing opportunities of RFID. Apparel retailers can select among the presented variety of RFID applications the most relevant ones based on their situation, strategy and store format. In a following step they need to financially evaluate the expected business value for their company. Together with the value of all other RFID applications such as in supply chain management, an overall investment decision regarding RFID can be made.

RFID Is an Infrastructure Technology Making the Financial Evaluation Different

All in all, the costs of RFID have to be opposed to the increase in information quality, the new options of actions and better customer orientation [Wiedmann, Ludewig et al. 2005]. „RFID is also essentially an infrastructure technology. Many people, however, are still focused on RFID as an application. They ask how much it will cost and what return on investment they can expect from it. This is analogous to asking what the ROI on the Internet is and how it should be measured. Your network of RFID interrogators, or readers, should be viewed as an infrastructure upon which many applications will be built. The ROI is found in the applications, not in the infrastructure" [Rush 2005]. In this paper, many of such RFID applications have been presented. Together with all other applications of RFID along the supply chain, an overall evaluation of RFID by apparel retailers can be conducted.

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EDITOR'S NOTE: The following reference list contains the address of World Wide Web pages. Readers, who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that:

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