METROPOLIA UNIVERSITY OF APPLIED SCIENCES
UNIVERSITY OF LINCOLN
EUROPEAN MANAGEMENT DEGREE PROGRAMME

USING RFID IN COLLECTING CONSUMER BEHAVIOUR DATA

Case Senso: an RFID implementation for the apparel industry

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Thesis
March 2009

Acknowledgements

I would like to thank the brothers Rosendahl and RDN Oy for giving me the opportunity to carry out my placement in the company as well as use the media material and necessary data for this thesis.

METROPOLIA UNIVERSITY OF APPLIED SCIENCES
SCHOOL OF BUSINESS ADMINISTRATION

Degree Programme:	European Management
Majors in University of Lincoln:	Marketing and Management
Thesis title:	Using RFID in collecting consumer behaviour data Case Senso: an RFID implementation for the apparel industry
Writer:	Matti Nieminen
Year:	2009
Pages:	40 + 3 appendices

ABSTRACT

The purpose of this study was to identify the factors and fundamentals affecting consumer behaviour and understand the reasons behind its development to the 21st century as well as lay-out the visions and characteristics of modern information technology and the solutions it has to offer for retailers and brands to answer the changes of consumers' behavioural shifts.

The consumer and buying behavioural models were studied together with a conducted in-depth analysis of RFID usage in a real case apparel retail environment at Naisten Pukutehdas Oy. Also current examples and scenarios of every day shopping situations were used where the collection of consumer behaviour data is applicaple.

The author based his conclusions to the before mentioned studies and findings of the central project Senso, researched over a time period of nine months analysing the course of its developments. It was concluded that the findings promote the use of RFID in a modern retail environment to a certain degree without invading the consumers' privacy in a manner that serves beneficially the retailers, brands, and consumers alike.

Key words: Radio Frequency Identification, consumer behaviour, market intelligence

METROPOLIA-AMMATTIKORKEAKOULU

Koulutusohjelma: European Management

Opinnäytetyön nimi: RFID-teknologian käyttö kuluttajakäyttäytymistiedon keruussa
Case Senso: RFID-teknologian toimeenpano vaateteollisuudessa

Tekijä: Matti Nieminen

Vuosi: 2009

Sivumäärä: 40 + 3 liitesivua

TIIVISTELMÄ

Tämän opinnäytetyön tarkoitus oli havainnollistaa kuluttajakäyttäytymisen muutokseen vaikuttavia tekijöitä ja periaatteita sekä ymmärtää syyt sen kehittymiseen 2000-luvulla, kuin myös kuvata nykyaikaisen informaatioteknologian piirteitä ja ratkaisuja joita on tarjolla jälleenmyyjille sekä tuotemerkeille vastaamaan kuluttajakäyttäytymisen muutoksiin.

Opinnäytetyössä tutkittiin kuluttajan käyttäytymis- sekä ostomalleja yhdessä perinpohjaisen RFID-teknologian analysointimallin avulla oikeassa vaateteollisuuden jälleenmyyntiympäristössä Naisten Pukutehtaan tehtaan myymälässä. Myös ajankohtaisia ja päivittäisiä esimerkkejä sekä ostostapahtumakuvauksia on tutkittu missä kuluttajakäyttäytymistiedon keruu on mahdollista.

Kirjoittajan johtopäätökset perustuivat edellä mainittuihin tutkimuksiin ja löytöihin Senso-projektissa, jota tutkittiin yhdeksän kuukauden ajan sen kehittymistä analysoiden. Johtopäätelmä tukee RFID-teknologian soveltamista nykyaikaiseen jälleenmyyntiympäristöön tietyssä määrin loukkaamatta kuitenkaan kuluttajien yksityisyyttä ollen hyödyllinen jälleenmyyjälle, tuotemerkille, sekä kuluttajalle.

Avainsanat: RFID-teknologia, kuluttajakäyttäytyminen, markkina-älykkyys

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1. Thesis foreword

This bachelor's thesis is a study made also for RDN, Rosendahl Digital Networks Oy, a company in Finland, for their use and purposes. I had the chance to be a part of RDN and work with Senso during my placement there during the summer of 2008. During the six month period my work concentrated largely on Senso and it got me really interested in the project.
After my placement, I decided that I wanted to do my dissertation on it, as it is something very new and unheard of.

The purpose of this study is to explore, and analyse using marketing theory, the different solutions Senso has available for retailers to enhance their business. The solutions offer vast marketing, media, and consumer behaviour research possibilities, which are indicating the direction where modern retailing is heading. A grand part of the study will also focus on RFID (Radio Frequency IDentification) technology, as we will plunge in depth to analyse how exactly some of these rather fascinating solutions operate.

2. Introduction

Consumer behaviour has changed drastically in the 21st century. The average consumer seems to have less time to do shopping, when at the same time the general need to know more about the product has increased. In earlier times, through the daily interaction and experience of selling to directly to consumers, marketers could understand better the consumer environment and behaviour. However, the ever growing markets, growth of multi-national corporations, and diversifying supply have torn apart the bond, or direct contact the marketing decision makers once had with

consumers. The solution now is to turn to expensive consumer research to gather data which decisions are based on and learn more about consumer behaviour (Kotler et al, 1996, p.269). On the consumers side, the need for better, quicker, and individualised customer service has grown, and regrettably is something that many shops lack. The modern consumer and working environment has turned more hectic, as consumers have less time for their daily commuting due to different environmental causes like traffic for an example. At the same time many shops, brands, and retailers are struggling to maintain a loyal customer database, when competition is fierce and the supply so vast. In many cases the shops can lack attractiveness or cannot match the pricing strategies of similar vendors on-line. The rise of E-commerce has taken many retailers by surprise and it is unusual for a brand not to have its own Web shop.

In the presence of all these changes in consumer behaviour and ever tightening competition, problem solving solutions are more than welcome. Senso is one of them.
In a nutshell, Senso Retail Environment aims to answer these problems by collecting valuable consumer behaviour data, and increase the attractiveness of the physical shop environment. How is it done? With the help of the latest technologies, the real-time working Web 2.0 platform with dynamic software, and Radio Frequency IDentification.

3. Literature and theory review

The literature review of this bachelor's thesis comprises largely on marketing theory about consumer behaviour, buying behaviour, direct marketing, and the collection primary research. The books by Philip Kotler and Gary Armstrong, The Principles of Marketing, and Marketing: an Introduction, were used for the core theory emphasis on the subject. Together with the latest articles on the development of RFID in apparel retailing and the press releases published by RDN and its partners in the Senso Retail

Environment project and internal documents, a study has been prepared introducing the characteristics and influences of RFID into the modern apparel retail scene.

3.1 Factors influencing consumer behaviour

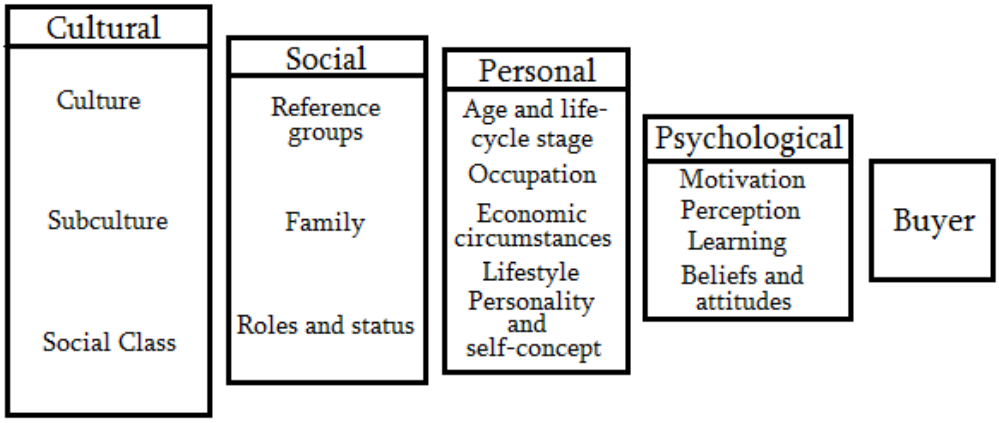

Figure 1.1 Factors influencing consumer behaviour (Principles of Marketing p.271)

What really forces or allows consumers to make their buying decisions is a melting pot of numerous factors. The above diagram (Figure 1.0) displays, the way an individual carries out decisions of purchase is based on the cultural, social, personal, and psychological events and issues one has faced during the course of life. Most of these factors cannot be controlled by marketers or advertisers alike, but carefully studying the factors with time can lead into a further understanding of trends and current movement of consumer behaviour and its direction.

Products all have different characteristics, they all have a purpose (for the most part) and are used to satisfy a certain need or want, that we as consumer have, created by the different factors of our life. As an example, the shift towards a more health and fitness oriented lifestyle has created a huge market for exercise equipment, clothing, low-calorie foods, fitness gyms, and a more natural, purer food diet (Kotler et al, 1996, p.271). These are the kind of cultural shifts marketers are trying to spot in order to

think of products that might be wanted later on.

3.2 Buyer behaviour model

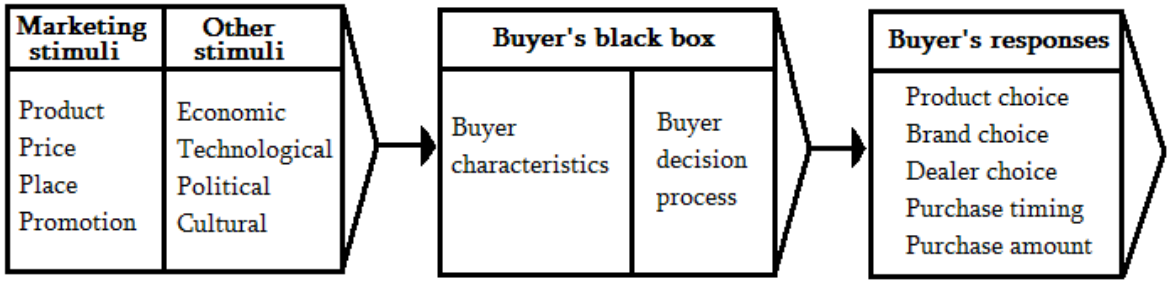

Figure 1.2 Model of buyer behaviour (Principles of Marketing p.270)

The figure 1.1 demonstrates the various types of stimuli affecting consumers' buying behaviour. In the end we can acknowledge the fact that the company which understands best how consumers respond to different product features and advertisement appeals will have the competitive edge. This is a reason why huge amounts of research resources have been placed in finding out the relationship with marketing stimuli and consumer response (Kotler et al, 1996, p.270). The 'Buyer's black box' is what keeps marketers on their toes, aiming to comprehend how marketing stimuli is changed into response according to the buyer's characteristics and the buyer decision process. We may never know exactly how the minds of consumers work in the buying process, but we can draw conclusions from the way consumers behave and the way they handle products, for example, in the apparel retail environment. Monitoring these 'Buyer's responses' can provide marketers and managers an insight to the consumers' mind and habits, as were about to find out with Senso.

4. Company portfolios, history, and key term definitions

4.1 Rosendahl Digital Networks Oy (RDN)

RDN Software logo, source RDN Media database

RDN is a full service software and media company established in 2005. It was established by Markus and Miikka Rosendahl who started developing apparel related software solutions for Naisten Pukutehdas Oy. After seeing that their software had potential, a decision was made to standardise the product and set up a company. RDN currently employs around 30 employees and has taken over the Finnish fashion industry with its dynamic B2B sales software, like the Vendor. This software enables brand vendors to present a company's product lines in a very fashionable way with detailed product descriptions and pictures. A demonstration of what clothing industries have sought for a long time implemented into a single application, praised by many, used by the fashion industry market leaders in Finland like Marimekko, the L-Fashion Group, and Virke to name a few. RDN has exploited the latest technologies including Web 2.0 and RFID, in developing new solutions especially tailored for the apparel retail industry.

4.2 Naisten Pukutehdas Oy (NP)

NP Collection logo, source: www.np-collection.com

Naisten Pukutehdas Oy is a Finnish fashion company with unique collections such as the NP Collection, NP Casual and NP Pants. Naisten Pukutehdas has a long history in the field of fashion since the year 1919, and concentrates solely on women's fashion.

The company is soon celebrating its 90th anniversary demonstrating the determination and guts the company has had during the arrival of large multinational fashion companies to Finland. To keep up with the modern pace of apparel industries around, NP has also moved its production abroad, mainly to China. With a chain of 10 stores in Finland, and the 11th on the way, combined with exports to Sweden, Norway, Russia, Ukraine, Latvia, England, Ireland, Scotland, Holland, Belgium, Germany, Austria, and France, NP has successfully established its own retail store base and expanded into international markets.

4.3 Web 2.0 environment

The Web 2.0 refers to the second generation of the World Wide Web. The term was first created by Dale Dougherty and Craig Cline to describe the changes in the Internet environment making the Web more of a working platform for different operations, applications, and numerous way of sharing media, all working in a real-time environment. While the actual Web 2.0 does not differ from the original application-wise, the change is implying on the methods of usage in terms of real-time updates, dynamic news feeds, video blogs, social networking sites like Facebook, and hosted services.

RDN develops applications mainly based on the Web 2.0 platform allowing a Software as a Service (SaaS) delivery method with easy and fast handled updating. The platform enables access from anywhere in the world as long as one has a computer and an Internet connection possibility.

4.4 RFID (Radio Frequency IDentification)

Technology-wise, RFID has been around for a while. The first uses of Radio Frequency Identification are from the second World War, when it was used as a method of identifying incoming aeroplanes. The benefits of RFID chips, as a method of information storage and identification, are many. It has been publicly acclaimed that the RFID chip will eventually replace the bar code, as it can store more data on a product and it does not need a clear line-of-sight to be read. For example, products tagged with RFID in a cardboard box can be read with a hand held RFID reader without having to open the box at all. Ultimately, the best benefits of RFID are to be witnessed in logistics, with the reading capabilities allowing for much faster logistics operations and better transparency reducing the time factor. All-in-all, a much better grasp of the product flow can be achieved tracking products at an individual level from the manufacturing point to the store shelf streamlining processes in an international scale.

4.4.1 RFID UHF GEN 2

The RFID Ultra-High Frequency Generation 2 chips are becoming the new global standard for passive RFID technology. A company called EPC Global is the leading developer for industry-driven standards for the Electronic Product Code to support the use of RFID in today's fast moving trading networks, and they are thriving to set the passive Generation 2 chip and its Ultra High Frequency to a global standard.
These are also the very same chips found in NP price tags on their garments. Passive technology means no internal battery is needed making the chip a relatively cheap to produce, around 0,05 – 0,10 € an inlay piece. To operate, the chips antenna will collect the needed energy from the electro-magnetic radiation emitted from a reader.

Figure 1.3 A type of UPM Raflatacs UHF Gen 2 chip displayed in natural size format. The black dot is the microchip and the hammer-like structure around it the antenna. Antenna measurements 76.5 x 23 mm.

5. RFID in apparel

In the apparel market and production, RFID has significant features and benefits over the traditional bar code. First of all, the data storage capability. In product detail, the RFID chip can go as deep as storing information on name, model, colour, size, and even the manufacturing location. A wider array of information can be stored in the tag. A key term to acknowledge with the technology is the unique EPC-code in the chip. With the EPC-code the product is one of a kind and the chip can not be duplicated, making the authenticated product ever harder to copy. RFID chips are a great way to fight off counterfeiting as items can be tagged and read later on when determining authenticity. According to Jarkko Kuusisto, Chief Executive Officer of Salpomec: "In increasingly global supply chains, apparel manufacturing often takes place on one continent with the goods being sold in an entirely different location. This increases the demand for up to date and accurate information throughout the entire supply chain. RFID can deliver this by offering increased levels of information and control."[1]

With the chips storage capability, before unseen information such as the exact location of manufacture can be informed along with proof of EU-standards being met in manufacturing, for instance, the product concious consumer may wish to know if the

1 Press Release: First Ever Apparel RFID Solution Centre Opens

item at hand has exploited child labour.

As previously mentioned, item level tracking can be conducted throughout the supply chain, from the manufacturing point to the store if a corporation has RFID readers placed in various places in the chain thus creating better logistical transparency. "Optimisation of the supply chain is a vital competitive factor for both apparel manufacturers and retailers alike," says John Smith, Vice President of Retail Sales for ADT Europe, Middle East and Africa. "Brand owners want to prevent counterfeiting, manufacturers want to save time and money by streamlining their processes, while retailers seek to improve their in-store and point of sale activities. The whole supply chain has to be transparent and effectively managed to truly help reduce out-of-stock situations and increase sales."[1]

In the shop, “smart modules” and other applications can be used to collect valuable primary data on consumer behaviour by monitoring the movement of RFID tagged garments, as we are about to find out more in detail when examining the Senso Retail Environment in chapter six.

The store inventory can be achieved faster with hand-held RFID readers when all items are tagged. All that is needed is for the salesperson to walk around the shelves and gather the RFID signals to the hand-held and proceed back to the system computer to update the current stock levels.

5.1 The benefits of RFID in apparel

- Streamlining logistical operations
- Counterfeit prevention and abolishment of grey markets
- Valid manufacturing information, product meeting EU-standards etc.
- Real-time individual item level tracking
- Consumer behaviour data collection
- More information available for the ever more product-concious consumer
- RFID tag adaptable for Smart Retail solutions
- Real-time stock level monitoring
- Inventory speeds up

6. Senso Retail Environment

Senso Retail Environment logo, source: RDN Media database

The idea of a new concept, called the "Smart Shop Environment" arose when the implementation of RFID tagged garments for one of RDN's main customers, Naisten Pukutehdas (or NP), was decided upon. NP had been following the development of RFID for a while and during the summer of 2007, NP began their pilot programme with RFID. Pleased with the results, all garments produced were being tagged at the production point with RFID from January 2008 onwards.

It was also becoming more evident that the modern consumer behaviour has changed due to the lack of free time, growth of e-commerce, and ever tightening competition and supply. Kotler et al (1996, p.878) state that among other factors, the increasing

number of women entering the workforce has decreased the time households have to shop. They also mention the higher costs or driving, traffic congestions and parking headaches, combined with the lack of retail sales help and longer queues at the checkouts have promoted in-home shopping.
Many retailers face a same challenge, how to attract customers, maintain customer loyalty and improve customer service? New solutions were needed to cope with the declining customer base and tightening competition.

The Senso Retail Environment was developed to provide these solutions offering many opportunities to improve customer service and enhance market intelligence. The project is a joined venture providing different kind of solutions for brands and retailers, regardless the area of business. The main founders are RDN and UPM Raflatac, (UPM's daughter company manufacturing mainly RFID products). Other companies and partners contributing to Senso are SML, Impinj, Microsoft, IBM and Digia.

The solutions Senso has to offer comprise of various interaction points, check-out systems, and an anti-theft solution applicable to the everyday shop environment or lay-out.
The interaction points include the following products or 'smart modules', like the Senso Fitting Room, Senso Information Post, Senso Media Station, and the Senso Web. Senso strives toward an objective to be able to offer consumers an unforgettable shopping experience. Working in the Web 2.0 environment, all functions in Senso are updated in real-time and the flow of information is accessible at all times from all around the world.

Currently Naisten Pukutehdas Oy, is the sole-pilotor of Senso, having Senso Fitting Rooms, Senso POS systems, and the Senso PDA in full operation in their factory outlet store in Hollola, Finland. NP has plans to expand Senso solutions to their other shops in

Finland as well as to the newly opened store in St. Petersburg, Russia.

6.1 Introduction to the Senso Products or 'smart modules'

The Senso Retail Environment consists of a number of 'smart modules' providing various solutions for retailers and brands to streamline their shop activities and offer customers a wide arrange of media material of product information. I have gathered here a small introduction of each of these smart modules in order to introduce the different qualities, possibilities, and benefits they have to offer to the consumers, retailers, and brands.

6.1.1 Senso Fitting Room

The Senso Fitting Room is an ordinary space for trying out clothes. What makes it "smart" is the touch screen PC, RFID antenna and reader that are integrated in it. The RFID tagged clothes that are brought in the fitting room are read by the antenna and the items appear immediately on the screen. From the screen the customer is then able to examine each product and will be provided with detailed product information, washing instructions, size & colour stock availability information, and media material such as high definition product pictures and videos. Additionally, the customer can browse the entire shop catalogue from the fitting room.

**Photograph a courtesy of RDN Media*

An important feature to mention is the cross-sales function that the Senso Fitting

Room has to offer. The system will monitor constantly which items are in selection and just like a "virtual stylist" it will suggest matching garment options to complete the ensemble.

A great benefit for the customer is the option to send product requests directly from the fitting room to a salespersons portable PDA (Personal Digital Assistant) device. This way the customer does not have to change clothes again and again as the salesperson will carry the product requested back to the fitting room.

6.1.2 Senso PDA

The Senso PDA is a sales tool intended for sales clerks in a Senso shop. It is a portable data bank for the salesperson, as well as the main appliance to receive the product requests sent from Senso Fitting Rooms. It can also be used to browse the stores full product catalogue and therefore help in matters relating to inventory or product details.

**Photograph a courtesy of RDN Media*

6.1.3 Senso Information Post

The Senso Information Post is like an information kiosk centrally stationed in a key location in store. It is basically the same touch screen and RFID reader & antenna configuration as in a Senso Fitting Room, with the same features, but located in the stores public area. The idea is that a customer may take a product close to it and receive more information on it, and/or request a sales clerk to the post.

6.1.4 Senso Shelf

The Senso Shelf is a tool for collecting consumer behaviour data. It will monitor with its RFID reader & antenna configuration the different products that are removed and returned to the shelf. All events will be time stamped and stored into the Senso database. More on the subject in the chapter "Consumer behaviour data collection and product performance monitoring" below. The Senso Shelves can also be set to alert sales personnel when the shelf stock has run low. Replenishment orders are sent to either Senso POS stands, or Senso PDAs.

6.1.5 Senso POS

The Senso POS, or Point Of Sale, is the RFID enabled cashier solution provided by Senso. The biggest benefit is the RFID reading capability enabling bulk-reading and no need for line-of-sight, as a bunch of products can be read simultaneously to the POS reducing waiting time. The Senso POS is also used to monitor current stock level situation and can be used along with a hand-held RFID reader to read in new arrived shipments to the system.

6.1.6 Senso Media Station

The Senso Media Station is basically a Senso Information Post, possessing the same features, but is equipped with an additional 40 inch LCD screen. The idea of the product is to catch the customers' attention and provide them with visual marketing, products offers and a media reel for pictures and videos.

**Photograph a courtesy of RDN Media*

6.1.7 Senso Web

The Senso Web environment is a customer portal and a complete web shop for consumers to access and operate from their homes. Customers can browse through the product catalogues in the same way as in any web shop and buy products delivered straight to their homes. The stores loyal customer base, or VIP customers can log into Senso Web and access their own profiles which are fully customisable. The Senso Fitting Room history is automatically available for the loyal customers displaying all the items that the customer has tried on in the shop fitting rooms. This way, if a customer really liked an item but didn't feel like buying it earlier in the fitting room, he/she can return to the fitting room history and complete the transaction.

The Senso Web also works the other way around. Loyal customers can collect a set of clothes from the web product catalogue and reserve it for a precise time they can arrive to the store. At arrival, the bag of selected items will be ready and collected for the customer to try out.

6.1.8 Senso Anti-Theft

The Senso Anti-Theft security solution uses the already attached RFID tags as alarm devices. This way a company does not have to invest in a separate alarm system. The Senso Anti-Theft gates are equipped with antennas monitoring item movement between them. Due to the antenna characteristics, they can be integrated in nearly any kind of gate structure or hidden in walls. The alarm function is removed during purchase after a completed transaction. The POS reader sends a signal to the chip disabling it. The disabled chips will not set off the alarm when brought near the gates. If an item that has not been paid for is brought through the gates, they will set off the alarm and send alarm notifications to POS stands and the salespersons PDA devices.
The notifications display the exact product that has set off the alarm making problematic situation sorting much easier.

If a customer returns a product with its original RFID tag still intact, the tag can be enabled again at a Senso POS and read back into the inventory.

7. The Senso VIP loyal customer programme and direct marketing possibilities

As previously briefly mentioned, Senso has to offer a unique loyal customer programme, where each customer recognised as loyal customer receives a personal RFID tagged VIP card. The card will be read at a Senso interaction point just like any other RFID tagged garment. After feeding in the security code, the customer is logged in for the session and can be set to receive special daily promotions or adverts about certain products available. The system also allows directed marketing to be made according to pre-set customer preferences saved in each customers account. When applying for the customer database, a form is completed with questions about product preferences, and each time the customer logs in at a Senso interaction point, directed marketing relative to their interest can be shown.

The system features also a smart learning module able to suggest items based on the loyal customers fitting room history. For example, if a customer has been trying on different skirts as of late, the system can display special advertisements of similar skirts. The Senso Web is also an opportunity to conduct directed marketing. The same adverts are also shown on-line based on the Senso Fitting Room history after a loyal customer has logged into his/her account. Creating more personalised marketing through the interaction points allows the retailer to build up a continuous customer relationship creating a steady stream of offers based on the customers' specified needs (Kotler & Armstrong, 1997, p.404).

8. Senso SWOT analysis

By compiling a SWOT analysis of Senso, we can better understand its internal qualities and opportunities in a wider scale.

Strengths – Lack of competition – Advanced adaptable software – A full end-to-end RFID solution – Market intelligence possibilities – SaaS and Web 2.0 distribution – Long experience in apparel	**Weaknesses** – RFID implementation costs – Short pilot phase history – NP the only reference – Financial crisis influence – Partner distributors
Opportunities – International expansion possibilities – Huge market – First global position – Diversify to other industries other than apparel	**Threats** – Current world economy situation – Customers don't pick up the idea – Rise of competition

Figure 1.4 Senso SWOT analysis

8.1 Analysis

8.1.1 Strengths

As listed above, the main strengths for Senso clearly are the facts that it faces no competition of the same level as of this day. Also, the profound experience that the founders of RDN have in the apparel industry have enabled them to create advanced software, based on continuous customer feedback and development. RDN has been following closely NP's implementation process with the RFID technology and has gained exceptional know-how of the system and its fundamentals. Senso offers many possibilities to enhance market intelligence by offering services and features to consumers they have never seen before. By launching the software installation and upkeep with the SaaS distribution model, RDN has been able to minimise the time and

costs for new customer software implementation.

8.1.2 Weaknesses

The other side of the coin has the fairly large investment costs to be made when starting RFID implementation. This narrows down the possible customer base for Senso, larger retail chains such as H&M probably will not adapt to RFID in any time soon, and needless to say, it probably never will have to. For apparel retailing the more adapt market segment would be the higher-end retail stores and brands such as Hugo Boss or Diesel, able to cope with the individual RFID tag price and adding more value to their exclusive stores. For now, NP is the only company who has Senso products in use. The lack of references can set off possible new customers or fail to convince them of the concept operation. It can also be a weakness that the pilot programme at NP is located in a single shop. When Senso will be implemented in other stores of the NP chain, a much broader range of data can be gathered and compared creating more interesting statistics with areal and even international influences. When the whole Senso Retail Environment can be demonstrated in action, and displaying the acquired data, potential customers will see the complete working solution.

The current financial situation is a big issue at the moment world wide. Needless to say, it might also affect the companies working with Senso, making certain aspects of development more harder to reach in specified time frames. Delay in projects is never a good thing, now would be the ideal chance to boost Senso through all channels available as there is no competition able to follow. As an international company like RDN, and a project like Senso, aimed for abroad markets as well, the meaning of gaining reliable partners who can help in national marketing related issues and promotion is key. The partner base for Senso is growing, currently there are demo rooms being built in various locations globally including Germany, Spain, Brazil, the United States, and China. This is an important first step as localised demo shows can be

arranged for local retailers and brands, thus getting prospects better introduced to the concept.

8.1.3 Opportunities

Opportunity-wise, Senso has many. As the software is easily distributed and managed, once the hardware is in place, international expansion is quick. The international apparel markets are diverse, and the response RDN has gathered from numerous contacts has always been positive. Being such a sophisticated, ready concept, Senso could have the opportunity to build itself to a strong brand all around the world. This would of course require the use of local partners and distributors of hardware to work in sync. All along we have been discussing Senso with apparel retailing, that is the first area where Senso was created for. However, the Senso Retail Environment, especially particular parts of it can be adapted to other industries as well. It does not really matter which industry is in question, the need for better solutions to deal with customer service and enhancing market intelligence is needed in a global scale. In this way there is an opportunity for Senso and RDN to push the concept to other industries without boundaries.

8.1.4 Threats

For threats one can definitely once again list the current economical situation. It affects the way companies are currently willing to invest in new technology or solutions. The modern phenomenon in Finland is the huge lay-offs the industries face trying to cope with the declining sales. Nevertheless, the global financial crisis may also wake up the apparel retailers to understand that changes made in the current way of retailing should be made to increase sales and attract more loyal customers. As always, we can criticise if enough marketing research was conducted to determine the true need of such “smart products” in current retail stores. Naturally the founders of Senso perceive

it as the next best thing after “sliced bread”, and a solution which is bound to gather up more loyal customers and streamline processes in store. However, currently such information can only be gathered from the single NP store housing Senso products, and it will be for some time longer until the evidence is formed to support the promises of marketing texts. So far, the response from the customers of NP have been widely positive and everybody regard the system as “high-tech” and really future-like. No negative comments have been received up to date. Eventually, every race becomes a two horse race, implying that it will not be long until competition will challenge Senso with similar solutions. But it is good to remember that if Senso can build up its brand name in a global scale, quoting my lecturer Mr. Simcoe “Its better to be first than it is to be better.”.

9. Consumer behaviour data collection and product performance monitoring

The exact way why consumers behave the way they do, or buy what they buy has troubled the minds of advertisers and marketers for decades. How can we access the latent wants people have inside their heads? How could we get an insight to what direction the trends are heading in order to get a head start and make good sales?
We know that buying behaviour is a result of many factors: cultural, social, personal, and psychological. For the most part marketers cannot control them, but they all must be taken into account (Kotler et al, 1996, p.270)

Consumer behaviour has also evolved a lot from what it used to be only ten years ago. Rob Norman from GroupM discusses the “philosophical” advertising shift in DMNews article (Nov 4th 2008) saying “Consumer behavior has changed radically, because consumers' expectations have changed. They expect that they get everything they want or need to know pretty much on demand 24/7. They don't need to mail in coupons or

make a phone call to get more information, they just click.“.

The Internet is flooded with information from thousands of sources making the search of any kind of information virtually possible. The reply to most problems or conversations can be ended with the following phrase “Google it!”. Mr. Norman also continues explaining the biggest challenges in tracking consumer behaviour, “One thing that frustrates me a bit is that the on-line advertising world has been pretty obsessed with getting right down to the bottom of the purchase level and last-click attribution. We need to look at all the things people do on-line and attribute that sale in a more representative way than just the last click, which still doesn't recognize the impact of TV, print, in-store or broadcast.”.

Just as in retailing, one can always calculate at the end of the day which products have sold the most. But what is left unseen is the way the products are handled and moved about in the store. This is the key information, especially in the apparel industry, that if collected and analysed, can really help managers to deduce the reasons behind consumers' actions.

10. The Senso solution

One of the greatest benefits that Senso has to offer for the brand and retailer, is ultimately the collection of valuable primary data on consumer behaviour. With RFID technology, the fact that each item in store is tagged with an RFID chip, individual product movement can be monitored inside the store and the data is recorded into the application database later to be analysed in the Business Intelligence software module. What this means, is that the actual physical movement of a product is monitored at the customer interaction points: from a shelf to a fitting room to the cashier. Below are three sample scenarios of everyday shopping situations, that could be made in a Senso

Retail Environment.

10.1 Sample scenario 1:

A customer takes a t-shirt from a Senso Shelf. After a brief examination of the product, the customer returns it back to the shelf.

What happened:

The data collected in this brief scenario was stored to a database recording the time an item was removed from the shelf, and the time it was placed back on the shelf. The shelf RFID reader reads the shelf with an antenna and notices that a product that was there a second before, has been taken away. Once returned, the reader again picks up the lost signal.

Deduction:

We may deduct a number of things from this type of scenario. When a customer takes an item off the shelf for more detailed observation, it has caught his/her attention, so the design or material may seem appealing. However, depending on the time held for observation, and evidently the return, we can deduce that the product did not satisfy the customer for further action, like the fitting of it. Why? Perhaps the customer saw the price tag and decided that it was too expensive or the material feel was not right for the customer.

The acquired data analysis:

Over a period of time, the more recorded movements at the shelf, we can gather up more of this product removal information, thus seeing clearly which products are appealing to customers due to their shelf-removal rate, and which are not. Monitoring also which shelves attract the most removals can lead us into investigating the physical

shelf placement in store. Is it a particularly good location, is there something else near the shelf that would attract the customers, or are the products on the shelf the popular kind that eventually end up being bought? This data will help in redesigning a more attractive store environment.

Figure 1.5 In this illustration, RDN Media department has given a demonstration of what the statistical output of product movement data could look like. A complete description and a photograph of the product in question accompanied with graphs of product movement stating the events: 'Taken from shelf', 'Taken to Fitting room', and 'Bought products'.

10.2 Sample scenario 2:

A customer takes a t-shirt from the shelf and takes it to a Senso Fitting Room to try it on. After a while, the customer returns the t-shirt back to the Senso Shelf.

What happened:

The data collected in this scenario was stored to a database showing the t-shirt removal from a Senso Shelf and its entry to a Senso Fitting Room, and back again to the shelf. The shelf reader notices that an item was taken away from the shelf and to the fitting room, as the fitting rooms own RFID reader picks up the signal. After a while the signal

disappears from the fitting room and is regained on the shelf. This movement and the time frame it was made was now stored into the system database.

Deduction:

The customer has once again found the item to be appealing enough for shelf removal, and the quality/material/price has been pleasing for a further try on in the fitting room. The item was taken into the fitting room but returned to the shelf shortly after. The most common case in this situation may be that the item was not of the desired fit or failed to please the customer's eye in another way. Also the pricing may still produce a buying threshold for the customer.

The acquired data analysis:

Analysing the movement of products in store, from shelves to fitting rooms and back will ultimately help to see if there is a pattern with certain items, or if other products simply are returned more the shelves after a try out in the fitting rooms. Such patterns may imply of a defect or a modelling fault in the items in question. Pointing out the items that receive the most returns to the shelf will aid in deduction the reason behind them. Discussion can then be arranged with the brand for further investigations in the products and valuable data has been gathered contributing to the designers for better fitting garments.

Figure 1.6 In this illustration, RDN Media department gives a demonstration of how the business intelligence module can be used to compare products, in this case a specified Jacket and Pants, by different sales events and how the events have occurred over a certain period of time.

10.3 Sample scenario 3:

In the end the most favourable scenario for a retailer or a brand would be that the customer removes a t-shirt from the shelf, takes it to the fitting room, and lastly to the cashier, or even straight from the shelf to the cashier, and buys it.

What happened:

In the most favourable scenario stated above, data is being collected from each of the interaction points as the t-shirt is being carried the the cashier. The RFID readers in each Senso interaction point, the shelf, fitting room, and cashier (or POS = Point Of Sale) pick up signal emitted from the RFID in-lay in the t-shirts price tag. This information is stored in the system database and the time frame the item passed through the interaction points.

Deduction:

For a product to end up being bought, it must satisfy the customer needs and wants, or possess a low price for an impulse purchase. In this case the t-shirt was picked from the Senso Shelf, brought in a Senso Fitting Room, and bought at the Senso POS making it a so called “successful” product.

The acquired data analysis:

By filtering out the successful product information stored in the database, managers can clearly see the items that have been selling the most and hence make future decisions based on these facts. For instance, seeing that a type of product sells better than others, the store manager can anticipate some of the the future sales better to some degree as consumer behaviour data is clearly available as descriptive statistics. This is a benefit for the retailer, as the ordering of the next collection will be less of a gamble.

10.4 Summary

The examples given clearly point out the way product movement data can be analysed and used in favour of the retailer, and provide valuable information to brands how their products are actually performing in the market. Also spotting out the 'bad' products becomes easier and appropriate feedback can be provided for the brands manufacturer department, for example.

11. Senso data flow diagram

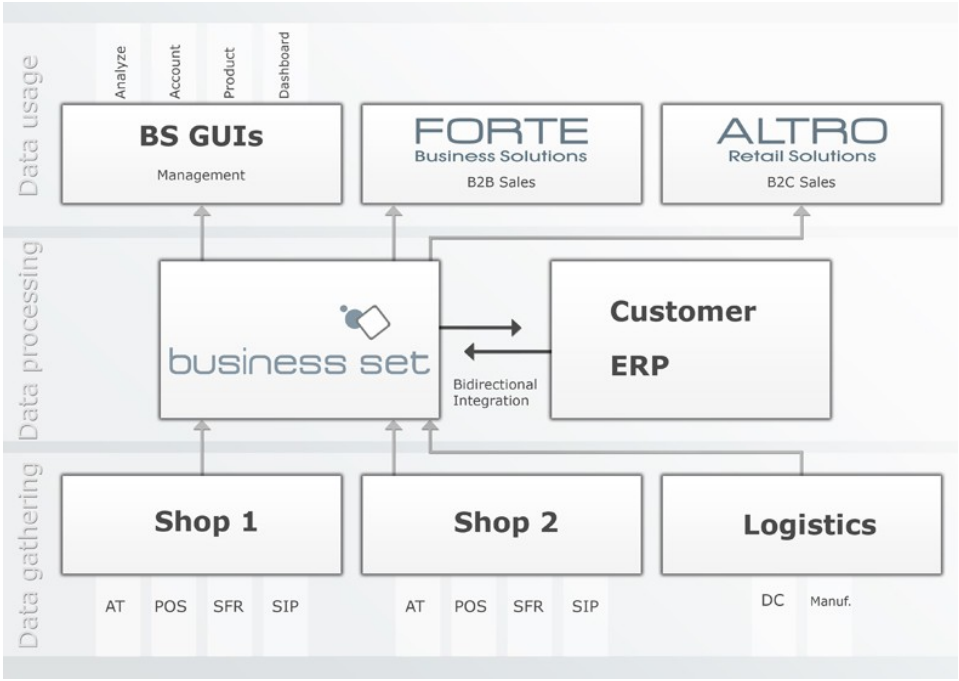

Figure 1.7 The Senso data flow diagram, source RDN Media database

The above diagram displays the way data flows throughout the Senso system. The main core is the Business Set program, designed to dynamically combine information from all Senso products to its Business Intelligence module. The Business Set receives real-time data from each Senso stores Senso products that are in use, such as the Senso Fitting Rooms (SFR), Anti-Theft (AT), Senso Point of Sale (POS) or Senso Information Post (SIP). The Business Set also stores data on Logistics operations, and provides great tools for ordering and storage in the Order and Warehouse -feature tabs. Business Set is also configured to a bidirectional integration with the customers own Enterprise Resource Planning -program (ERP). The Business Set can be accessed from different Graphical User Interfaces (GUIs), thus the collected data can be viewed and analysed anywhere at all times. The Business Set is also configured to work in sync with RDN's other products from the Forte and Altro product lines, such as the previously mentioned modern salesman's tool Vendor.

12. The Senso surveys

Another way of gathering information and primary data from consumers is by handing out feedback forms with a number of questions to be filled out. While valuable for the retailer or brand, these questionnaires tend to be bothersome and customers do not like filling them out. Survey research is one of the best ways of gathering descriptive information due to its flexibility. It can be used to obtain various types of information in different kinds of situation with a relatively low cost compared to observational or experimental research (Kotler & Armstrong, 1997, p.119). What Senso has done is to give the possibility for customers to take part in a survey during their shopping for instance, in a Senso Fitting Room. While trying on a garment, one might get a notice on screen saying "Would you like to answer a few questions concerning this product?" and if followed by a positive reaction, there would be a number of questions relating to the product. This way the retailer or brand could gather up immediate feedback on the product, how it fits, which colours are preferred, and whether the material satisfies the customer. With RFID implementation, incentives such as minus five per cent discount can be administered as the RFID reader in a fitting room can modify additional qualities to the product at hand, in this case displaying a discount when taken to the cashier.

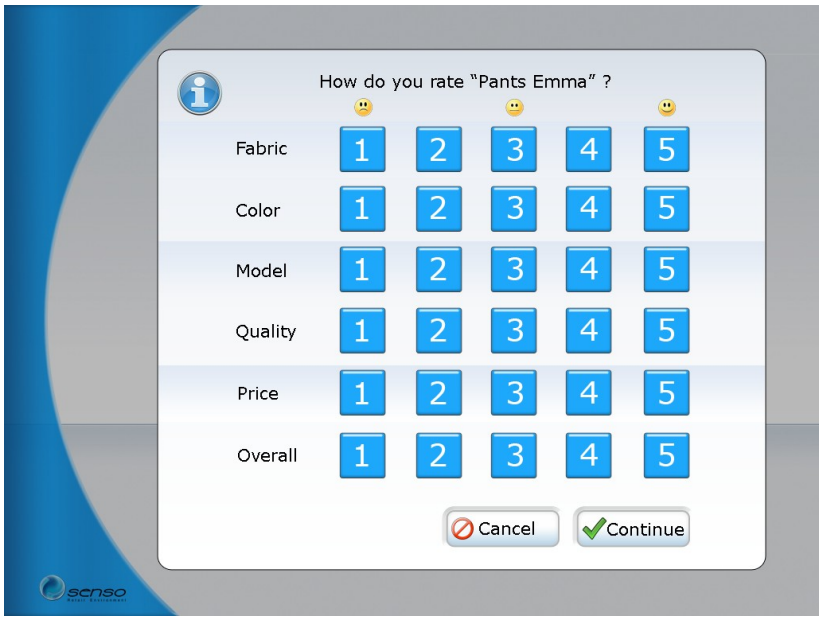

Figure 1.8 An example illustrated by RDN Media showing the possible format of a product survey displayed in a Senso Fitting Room. The survey would come to the screen while the fitting, and the customer can take the time to answer it, if so wishes. In this illustration, the following question is asked "How do you rate 'Pants Emma' ?" Meaning precise model of pants in NP collection. Below it are attributes such as: fabric, colour, model, quality, price, and overall, with numerals from 1-5 with one being the worst and 5 being the best choice.

Figure 1.9 This illustration by RDN Media displays how the survey statistics could be formed showing the average figures of the specified attributes in the survey. Such information will be of great value to the brand and retailer alike.

13. The ethics of consumer behaviour data collection and product movement monitoring

So how would the customers feel when they realise that the way they handle the clothes in store is monitored producing data for the managers to observe? Basically with the presence of RFID, the monitoring, sounding as devious as it may be, is done virtually inconspicuously. As the readers are able to pick up signals from a distance, no additional effort is placed upon the customers, but only to conduct their shopping in a normal fashion. In a way I see this as a strength the system has to offer. Needless to say, a bar coded system would not work, how would you encourage people to read the bar codes manually in each interaction point? Incentives maybe, but it will be a burden and most likely an unsuccessful method of gathering data. In the end, the purpose for gathering consumer behaviour data is to create statistics onto which managers can better rely on when facing challenges, to ultimately make the best decisions. However, I also see this as an opportunity for the customers to help themselves to receive better customer service and also to create a better shopping environment. As the way the consumers move about in the store, will lead to a shopping environment shaped by themselves. Also, there is no need to fear the RFID technology would intrude the customer's privacy outside the shop area. The product movement monitoring is only conducted inside the store, and once the items are paid for, the chip will be disabled electronically, and removed as well if the customer so wishes.

The multinational level brand Levi Strauss & Co launched a small scale RFID implementation in three of its stores in North America in 2006. The aim was to monitor the working principle of RFID in inventory related issues. However, a U.S. privacy group called the Consumers Against Privacy Invasion and Numbering (CASPIAN), an outspoken critic of RFID chips, started campaigning strongly against it appealing to the invasion of consumers' privacy.

In the end, the implementation process was cancelled and all the RFID tagged garments were pulled off the market[2]. Now, I do not judge the way CASPIAN worked in this case. Everybody has the right for their privacy, but in a way I see this as a largely exaggerated case of consumer privacy invasion. A group so devoted to their beliefs will not stop to take anything down in their way of thinking. Also I believe there never was enough emphasis from Levi's side concerning the fact that the RFID chip can and will be removed after purchasing, meaning that the chips will never leave the store, hence tracking of consumers ends instantly when walked out of the shop gates. Sure RFID was designed as a tracking technology and that is its main purpose still today, to track and categorise. But it is not all bad. What the group like CASPIAN has done, is to categorise RFID as a complete tool of the devil without trying to understand the mutual benefits it has to offer to retailers, brands, and consumers alike.

In the long run, monitoring the way customers behave in the store allows the managers to constantly improve their store lay-out and order in more products, or similar products that have created a keen interest among the customers of the store. This way the manager is providing the customers something they want, determined by their own actions. This makes Senso a very valuable tool, helping retailers to understand more what customers want in the modern and expanding market environment.

14. Conclusion

Consumer behaviour change is upon us. In this thesis, I have covered reasons behind the change and discussed how the complete solution, Senso Retail Environment, has stood up for the challenge.

2 CBC News: Marketplace on-line at: http://www.cbc.ca/consumers/market/murmurs/archives/2006/20060502_rfid.html [accessed 27th March 2009]

As each item is unique due to the RFID tags EPC-code, the individual product movement data can help us in analysing various aspects of consumer behaviour, or even market demographics. The trying on data from the fitting rooms, such as the tried on different sizes, colours, models can ultimately gives us valuable information into which sort of direction modern trends are heading. This is a very useful tool for brands as they can get a better insight on consumer behaviour by examining and analysing the detailed graphs produced by the Business Intelligence platform monitoring actual product movement in store. Combined with the possibility to create and target surveys through Senso's customer interaction points, the amount of primary research that can be collected is massive. The statistics can ultimately give decision makers the right information to make the right decisions.

Evidently, the current economical situation poses a threat for companies to perform large scale RFID implementation due to the cost factor. However I believe it is a worthy investment and studying the successful pilot programme of Naisten Pukutehdas Oy, it is not a thing of the future, but very much a technology that prevails among us already. Creating the right message for consumers is key when dealing with RFID. The term has been branded with a slightly negative reputation due to the past incidents like Levi's, and the purpose it serves as a tracking device. In the end, using RFID should be used to create beneficial circumstances for both the seller and the buyer without any hidden objectives, like the way Senso has intended to do.

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KEY WEBSITES

www.np-collection.com www.sensosolutions.com

www.rdnsoftware.com www.upmraflatac.com

APPENDIX

PRESS RELEASES

- Press release 10th November 2008

UPM Raflatac supplies RFID tags to NP Collection's intelligent clothes store
RFID supports smart changing rooms and accelerates check-out services for smoother customer service

(UPM Raflatac, Tampere, November 10, 2008) - Finnish apparel company NP Collection has opened one of the most advanced intelligent clothes stores in Hollola, Finland. In this new store, customers can try on clothes in intelligent changing rooms supported by RFID technology. When trying on clothes, customers can use wall-mounted touch screens to browse additional product information, view suggestions for matching clothes and accessories and have alternative products or sizes brought straight to the changing room. NP Collection also uses a check-out system with RFID reading abilities to speed up customer service.

RFID tags are attached to all NP Collection's products during manufacture, and data from the tags is read at several points all the way to the central warehouse. The capacity to follow the stream of goods in real time provides substantial cost-reductions in logistics and manufacture. On the store level, this data can be exploited to plan shelf-use in advance, for example. Finally, the RFID tags can also function as antitheft devices.

The RFID implementations continue a development project initiated by NP Collection in 2007 which covers the entire supply chain. The project aims to rationalize and intensify logistic processes and provide added value to customers by improving service levels.

The intelligent store concept will expand to St. Petersburg, Russia, during November, where NP Collection is opening a new clothes store equipped with smart Senso modules similar to those currently used in Hollola. During the next six months, the company will also implement a new, RFID-assisted Shop in Shop concept designed for use in NP Collection's retailers' premises.

The solutions are supplied through cooperation between several parties including UPM Raflatac, RDN, SML, Impinj, Microsoft, IBM and Digia.

NP Collection

Suiting up for change: You're a Finnish fashion company with a history of sartorial success that dates back to 1919. Although you're proud of your staying power in the fickle world of fashion, you don't ride the industry's coattails. Instead, you're an innovator who's constantly looking to break the next trend, as well as use technology to its full advantage. How can you make it easier for your customers to see their best selves as the ones wearing your clothes?

If you're NP Collection, you use RFID's powerful capabilities to enable development of intelligent stores, which turn shopping into a truly interactive experience.

While retailers have long used staff to cross-market products to shoppers, NP Collection takes this concept a step further by installing intelligent changing rooms. In stores in Hollola, Finland, and in 2009 also in St. Petersburg, Russia, shoppers can use wall-mounted touch screens to browse product information, view suggestions for matching clothing items and accessories and request that RFID-tagged merchandise be brought directly to their changing rooms. In addition, an RFID-powered checkout system accelerates transactions, ensuring that the customer experience is superlative from start to finish. The result? The opportunity to drive store revenues by providing shoppers with the opportunity to consider a wider range of items that might interest them.

UPM Raflatac tags are attached to NP Collection goods during the manufacturing process, enabling the company to track products as they move throughout the supply chain. Real-time data offered by the RFID solution provides NP Collection with the insights the company needs to improve product manufacturing and inventory management, drive down logistics costs and reduce shrinkage and theft. Of equal importance, the richly detailed information helps retail staff optimize point-of-sale merchandising by planning shelf usage and ensuring that top-selling merchandise is always in stock.

"We've been following the development of RFID technology for many years," says Mr. Risto Rosendahl, Managing Director of NP Collection. "Thanks to our state-of-the-art RFID solution, the product handling rate has improved tenfold and human error has been eliminated."

UPM Raflatac teamed with other industry leaders including RDN, SML, Impinj, Microsoft, IBM and Digia to deliver an innovative RFID solution for NP Collection that's a good fit for all seasons. The first Scandinavian fashion company to pilot RFID, NP Collection has used its successful experience to move from a dress rehearsal to a

larger-scale implementation of the technology. The company, which has been tagging clothes at a European manufacturing plant, has expanded its program to include Chinese factories, ensuring that all garments it ships are RFID-tagged—and tracked.

By providing NP Collection with a comprehensive solution that streamlines supply chain and enhances customer-facing operations, the company's RFID partners have demonstrated that their solution is more than just elegant window dressing. Instead, the solution delivers results – better visibility, lower costs, higher margins – that will always be in style. -

Online at:
http://www.upmraflatac.com/europe/eng//RFIDProducts/References/38_67829.asp?ComponentID=67829&SourcePageID=41951#1 [Accessed 26th March 2009]