# THINK ACT BEYOND MAINSTREAM

## **Robots and retail**

What does the future hold for people and robots in the stores of tomorrow?





2016

## THE BIG



## **10 billion euros**

### marks the size of the android robot market in 2025

page 4



is the annual reduction in the cost of manufacturing robots able to interact with humans

page 4

## 30 times

more interactions per day between humans and robots than between humans and digital terminals

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# From a transactional role to an image role: rethinking store models with robots.

Increasing commercial wasteland in the USA is testament to the challenges now facing traditional retail outlets. Deserted stores are telling warning signs that have served as a wake-up call for retailers, who must react quickly to the evolving retail landscape. While some retailers have managed to maintain revenues by opening more sales outlets, they need to rethink the economic balance of investment in sales outlets and customer flows.

In an environment where digital sales are set to double over the next 10 years, reaching an average of 20% to 25%, stores can no longer restrict themselves to solely a transactional role, which itself is increasingly being fulfilled by e-commerce. They are going to have to boost their role as purveyors of an image, implying a radically different economic model.

In this new ecosystem that combines physical outlets and digital sales, economic pressures are forcing retailers to seek economical solutions to reinvest in stores. Robots – now affordable and offering substantial gains in terms of competitiveness – is one possible answer. Robots are any forms of "mechatronic" device (combining mechanics, electronics or computers), which does not necessarily need to look human and which can accomplish tasks that are generally performed by people. Robots can also free people of the need to perform dangerous and arduous tasks, or take charge of certain simple – and even complicated – repetitive activities, performing them better than humans. Is it conceivable that the stores of the future will no longer feature human staff?

Researchers from Oxford estimate that 92% of sales staff could be replaced by machines by 2023. This figure may appear far-fetched, especially at a time when customers are increasingly demanding as regards service and remain strongly attached to personal contact with a sales assistant.

Robots will certainly be used to supplement people in stores. But for what type of task? To what extent? In which stores? For what types of customer flow?

Robotics must generate a number of opportunities, the first of which is to create a new customer experience. In addition, it needs to optimize customer pathways, by providing new data and new analytical tools, especially in real time. Then it must also increase fluidity of in-store procedures. Last but by no means least, in-store robots must be used to perform a high number of tasks with low customer added value.

# <u>Gifted with intelligence</u> <u>and the ability to</u> <u>understand our emotions,</u> robots are a source of both fear and fascination.

#### **INCREASINGLY INTELLIGENT ROBOTS?**

Machines played a pivotal role in both the industrial revolutions, replacing people in heavy, difficult and sometimes impossible tasks. Whereas the first two industrial revolutions enabled machines to reduce the strenuousness of human effort (invention of the steam engine, mechanization of assembly lines) and the third saw the introduction of computers and automation, the fourth industrial revolution relies on robots that are now connected, gifted with intelligence, and gradually working their way into factories, offices, households and... retail stores.

As with the previous industrial revolutions, machines at once replace and augment human efforts. Now, they are also penetrating fields of empathy and intelligence; generating both fear and fascination.More specifically, new generation robots are able to detect and identify – with the help of sensors and cameras – certain human emotions. Happiness, fear and sadness are all recognized by robots, which can then act and interact appropriately, even simulating their own emotion. Soon, robots will be able to communicate and acquire experience. They will, for example, be able to correct and adapt their gestures as operations progress, thus marking a major breakthrough that some people are referring to as the "fourth industrial revolution".

#### A \$52 BILLION MARKET IN 2025: EXPONENTIAL GROWTH

The segment of robots designed for retail stores is emerging in a global robotics market that is already significant (\$19 billion in 2015) and growing steadily (\$52 billion in 2025). **Cost reduction** and increased commercialization of service robots in Europe are the main drivers of growth, which is set to be particularly high between 2015 and 2025, with an average growth rate forecast at nearly 11% per year. According to the World Robotics 2015 report, the robotics market can be broken down into 3 separate segments, namely industrial, professional and personal robots. Professional robots are mainly involved in the fields of medicine, agriculture, defense and logistics.

Personal robots include robots that carry out domestic tasks (vacuuming and washing), as well as robots for entertainment and assisting the elderly or disabled. Retail robots are situated midway between professional and personal robot categories, as they play a role both in "closed" worlds (such as logistics) and in general public environments, namely stores, where their functions include welcoming, preparation and information.

A study produced by the Robotic Business Review forecasts that the market for androids could reach **10 billion** euros by 2025.  $\rightarrow A$ 

#### EVOLUTION OF ARTIFICIAL INTELLIGENCE FROM 1956-2016: MAN SURPASSED BY MACHINE

#### <u>1950</u>

**Turing test** – Aimed at identifying whether a human being or a machine is answering our questions

#### 

Dartmouth Conference – Definition of artificial intelligence

#### <u>1973</u>

Wabot-1 – First humanoid robot created in Japan

#### ••••••

#### <u>1997</u>

**Deep Blue** the IBM super calculator beats world champion Garry Kasparov at chess

#### .....

<u>2000</u>

Asimo Robot by Honda Robotics

#### 2006

Nao Robot by Aldebaran Robotics

#### 

#### <u>2012</u>

**DeepLearning**, the Google algorithm is able to recognize cats from among 10 million images in YouTube videos

#### .....

#### <u>2014</u>

**The Eugène Gootsman program** passes the Turing test. 33% of judges are convinced after a 5-minute conversation

#### <u>2016</u>

**AlphaGo**, Google's Deep Mind computer program, beats the South Korean champion, Lee Sedol, at a game of Go

### Α

#### SPENDING ON ROBOTS IS SET TO INCREASE 3.5-FOLD IN 10 YEARS

Sales of robots [in USD billion; 2013-2025; excluding military]



1 Annual average growth rate

Source: World Robotics 2015, Roland Berger analysis

#### THE UNCANNY VALLEY THEORY

To fully capitalize on these favorable growth trends and be accepted by the general public, robots must, however, comply with certain "human" codes, but without exactly replicating humans. This is the theory put forward in 1970 by the Japanese robotics professor Masahiro Mori in his "uncanny valley" theory, in which the more similar an android robot is to a human being, the more its imperfections appear to us monstrous. Indeed, his thesis describes the revulsion that certain people may feel when faced with a robot that appears overly human and which has retained certain imperfections. This discomfort is linked to deep feelings of uncertainty and perceptive dissonance (human or non-human?). Beyond a certain level of perfection in imitation, realism is such that anthropomorphism once again becomes acceptable. The challenge for consumer-facing robots is therefore complex, since robots need to look human and kind, but without looking too human and kind.  $\rightarrow \underline{B}$ 

## B

THE UNCANNY VALLEY

### When robots resemble us too much, they become monstrous



# Japan: <u>a particularly</u> <u>mature market</u> for robots.

#### AN AMBITIOUS STRATEGIC PLAN FOR ROBOTS TO BOOST PRODUCTIVITY

In 2015, Japan announced its strategic robot development plan in response to crucial labor requirements, depopulation and a fall in hourly productivity in its services compared to other world powers. In a highly fragile economic context (0.4% growth in GDP), historically low unemployment (3.2%) and over-representation of the elderly (25%+ of the population are over 65), the country has made the deliberate choice of turning to robots to improve its competitiveness and re-boost its economy.

## A RETAIL SECTOR THAT IS LESS PRODUCTIVE THAN THE NATIONAL AVERAGE

100 billion yen (nearly 1 billion euros) are set to be invested in robotics over the next five years via public-private partnerships with the aim of making Japan a robotics laboratory with global influence. The 2020 objectives are clear and ambitious: the government hopes to increase the market fourfold (up to 2400 billion yen or 18 billion euros) and achieve an annual increase in productivity of 2% in 2020 (compared to 0.8% today).  $\rightarrow \underline{C}$ 

Japan wants to encourage the development of low-cost robots and, in particular, support the introduction of robots in no fewer than 500 small and medium-sized businesses. Automation is therefore seen as the way to support SMEs (which make up over 90% of companies in the country) and the tertiary sector (over 70% of jobs). This includes agriculture, medicine, nursing care and retailing in particular.  $\rightarrow D$ 

#### WIDESPREAD EMPATHY TOWARD ROBOTS: PARTNERS IN EVERYDAY LIFE

Far from being distrustful of robots, the Japanese have made them an integral part of their everyday lives. Humanoid robots have been introduced in particular into certain retail outlets, mainly for the purposes of welcoming and directing customers. The Pepper robot has made its debut both in the stores of major brand names (such as Nestlé, Nissan and the telephone operator Softbank) and in over 1000 independent retail outlets.

Indeed, public opinion is much more favorable than in Europe as regards the emergence of humanoid robots in everyday life. The Japanese feel strong empathy toward these creatures, as can be seen from Prime Minister Shinzo Abe's desire to organize an Olympic Games for robots in 2020.

"In 2020, I would like to gather all of the world's robots and aim to hold an Olympics where they compete in technical skills"

Shinzo Abe, Prime Minister of Japan

Living in a country mistreated by nature, the Japanese are fascinated by technology and are easily convinced, even mesmerized, by futurist and fantasy environments. They fully embrace the concept of the robot; the perfect incarnation of technological progress.

For the Japanese, the risk of intrusion into private lives and the loss of individual liberty remain an epi-

phenomenon compared to the proclaimed, perceived or anticipated benefits of robots. The Japanese appreciate being assisted, even if this means entrusting part of their responsibility to technology, in order to feel reassured and reduce the proportion of irrationality in their decisions.

## С

WORK PRODUCTIVITY BY COUNTRY AND SECTOR [production/hour, PPP in USD]

#### WORK PRODUCTIVITY BY COUNTRY



#### WORK PRODUCTIVITY IN JAPAN BY SECTOR



1 Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, UK

2 Value added services

3 Property and construction

Sources: Asian Productivity Organization, Roland Berger analysis

## APPLICATIONS AND EXAMPLES OF ROBOTS IN THE VALUE CHAIN OF RETAILERS

From welcoming customers and reducing irritants to in-store observation, robots now play a role throughout the retail value chain.



Sources: Press reviews, Roland Berger analysis

D

# Robots and goods management: <u>real help.</u>

#### A SOLUTION TO STOCK-OUTS AND THE END OF TIME-CONSUMING INVENTORIES?

Stock-outs, the pet peeve of retailers, could soon be a thing of the past, while the long, painstaking nocturnal hours dedicated to stocktaking could also be delegated to machines. This is what is suggested by recent developments in robots specialized in stocktaking autonomous robots that survey store aisles, analyzing and auditing shelves and identifying stock shortages. More generally, robots applied to in-store goods management (inventories, stock control and surveillance) may soon be enabling retailers to make significant savings and release staff from repetitive tasks. Firstly, by reducing losses resulting from stock-outs. According to a study by ECR France and Symphony IRI Group, retailers lose around 8.5% of revenue from total stockouts (6.5%) and partial stock shortages (2% in lost revenue when the goods are available in the stock area). Secondly, by reducing unknown shrinkage, in particular theft and administrative errors (1.5%). In total, the presence of stock-control and surveillance robots in stores could overcome a 10% loss in revenue.

#### SIGNIFICANT TIME SAVINGS FOR SALES STAFF

The biggest savings can be achieved in the productivity of sales staff, who currently spend between 10% and 30% of their time working on supply chain tasks, such as tidying, stock control and goods reception. At Tesco for example, the introduction of RFID (Radio Frequency Identification) chips enabled robots to complete an inventory in 1 hour that would have taken a store employee 7 hours, while at the same time considerably reducing the number of errors. In addition, this enables stores to make far more frequent, rotating inventories (instead of the 2 regulatory annual inventories) and ensure that articles are current, in the correct place and with sufficient levels of rotation.

#### SALES STAFF SPEND UP TO 30% OF THEIR TIME ON BACK-OFFICE TASKS

An analysis of sales staff working schedules reveals the proportion of time allocated to different tasks, with significant potential for optimization through the use of robots. For example, time spent in the back office in gardening/DIY stores (around 30%) is significantly higher than in other stores, due to the extent and complexity of the goods sold. This is where goods management robots come in, freeing time for sales staff that they can then reinvest in selling, advising and contact with customers, to achieve levels comparable with specialized high-street food stores.  $\rightarrow \mathbf{E}$ 

#### A TENFOLD INCREASE IN THE SPEED OF STORE INVENTORIES

But what do these goods control robots do exactly and at what stage of development are they really?

**Inventories and stock control** Recent technological developments have led to the emergence of inventory and stock control robots. Tory, Tally and Stockbot, are machines able to scan shelves, detect missing products and count articles, using RFID chips, NFC (Near Field Communication) technology and 3-D sensors. Productivity gains are instant: Tory, for example, scans RFID labels 10 times more quickly than a human operator. These robots also perform regular monitoring of merchandising plans, making them an attractive tool for reducing discrepancies in carefully centrally designed plans and reflecting the reality in-store, with close to 100% reliability (compared to 65% for humans).

### Ε

#### SALES STAFF SPEND UP TO 30% OF THEIR TIME ON BACK-OFFICE TASKS

Sales staff average working schedule





**Preparation and restocking:** Perhaps the real revolution will lie in assistance for employees in restocking, which can take up to half of their time (7% to 48% depending on the sector and type of store). The autonomy of this type of robot, however, still remains limited, due both to the technical complexity of the task and the need to adjust to a wide range of environments. Nevertheless, the tasks currently undertaken by robots in warehouses could be applied to the preparation of in-store orders. There is for example huge potential for optimizing time in the preparation of "Drive" orders (currently standing at around 50 minutes per customer). This is the promise of the young French company Scallog, already doing well with software developers and now considering expansion into the stores of food retailers.

### **SCALLOG**

A French start-up created in 2013, Scallog specializes in "goods to man" or the automation of distribution platforms. Its technology consists of a rack-carrying system moving throughout the warehouse to transport products to human packers, while optimizing the preparation of orders.

#### Key clients

L'Oreal/BSL cosmetics, IDEA aeronautics, GEMO textiles

#### Productivity gains

Each operator can handle up to 600 "picks" per hour compared to 100-150 when using the traditional pedestrian system

#### **Optimization of space**

Automation enables savings of up to 30% in warehouse surface area

Source: Roland Berger analysis

replenishment

## **HOW HUMANIZED CAN WELCOME ROBOTS BE?**

The development of humanoid robots is limited because the environment is still difficult to systemize.





# <u>Robots and customer</u> <u>experience:</u> entertainment or a real generator of traffic?

#### AN ULTRA-PERSONALIZED CUSTOMER WELCOME

The android robot Aiko Chihira, the hostess at the information desk of the Mitsukoshi department store in Japan, is probably the most "human" robot in the spectrum of humanoid robots. With the appearance of a 32-year-old young woman, this new creature developed by Toshiba in 2015 has been designed to replace the hostess at the information desk to advise and amuse the customers of this department store.

Dressed in a traditional kimono and animated by 43 different motors (15 of which are used to animate her face), Aiko Chihira can nod her head, blink her eyes and provide information on events in the store: "My name is Aiko Chihira and I'm going to sing you a song. A special offer on yukatas is currently taking place on the clothing floor".

Toshiba senior management clearly aim to replace certain sales staff in the long term, as one of the Group managers explained, "Our ambition is to develop a robot that can gradually take over the role of a human being. Introducing our humanoid in Mitsukoshi, which represents the very best in Japanese hospitality, is an excellent opportunity to see the role our robots can play in such an environment". So they are not just gadgets, considering that between 9% and 30% of the time of sales staff is spent on greeting customers, mainly on the fairly basic tasks of providing them with information and directions, which could be performed by intelligent robots. As machines such as Pepper, Tiki and OSHbot are increasingly being fitted with facial (gender, age, ethnic origin) and emotional recognition sensors, they are able to react more appropriately according to the type of customer they meet. Moreover, the robots can scan customers' loyalty cards to give them highly personalized product recommendations.

Multilingual vocal communication functions are highly relevant in tourist areas, enabling customers of all nationalities to be greeted and given information in their native languages.

#### THE PEPPER EXAMPLE

With their friendly, humanoid shape and personable tone of voice, robots used for greeting and providing information undeniably attract customers and pull in temporary crowds, even if only out of curiosity and the desire to interact with them. In-store experiments have not been sufficiently long to produce reliable statistics, but the experience in Japan has already provided promising indications.

#### **JAPAN**

**Softbank:** In March 2016, the telephone operator Softbank introduced 6 Pepper robots into one of its Tokyo stores to greet customers and guide them in their purchases. A single sales assistant was present, responsible for the payment desk and the signing of telephone subscriptions. Result: +38% in store traffic compared to a traditional store. 7 sales staff were reduced to 1.

**Nestlé:** An operation was launched in December 2014 involving 1000 Pepper robots providing advice at sales points in a department store, normally without sales staff. Result: + 15% in sales.

**Nissan:** The introduction of 100 Pepper robots in Nissan dealerships to provide information and entertain customers. Result: + 18% in customer visits.

#### FRANCE

**Carrefour:** At the end of 2015, the Carrefour Group experimented with animating sales points with Pepper robots in three stores in France and two in Spain. In France, 7 robots were introduced per store, with three tasks: welcoming customers, providing entertainment and promoting goods. Even though the experiment was much enjoyed by customers and store management, it does not appear to have had any real commercial impact. The number of interactions however remains **30 times** higher than the number of interactions with a digital terminal.

**Sephora:** The Nao robot was brought in to launch the Sephora Flash concept store in Paris – a small, 100% connected store, centered on digital technology, offering customers a wide product range and a new store pathway. However, the Nao experiment was inconclusive due to the low autonomy of the robot and over-simplistic scenarios programmed for the experiment.

**Costa Cruises and SNCF** also tested the use of Pepper on 7 ships and in 3 stations, mainly to provide information. Equipped with the multilingual function, the robots were designed to greet and direct tourists in their own language. It is difficult to say, however, whether the experiment had a real impact, especially in regional stations. The advantage in this case remains the multilingual function of the robot, which makes sense particularly in the case of a massive influx of tourists.

#### COMMERCIAL SUCCESS: IDENTIFIED PREREQUISITES

Although the various experiments in the use of welcome robots in retailing show they are of interest to customers, they are yet to reach their full potential in transforming sales and attracting more customers into stores in the long term. Indeed, performance is key to the credibility and success of projects. Facial and vocal recognition must be perfect to avoid disappointing customers, since any confusion with age or gender would be more serious than an absence of interaction and would negatively impact the customer experience.

It is, however, already clear that robots are particularly relevant in certain types of stores and with certain categories of products. We have identified 5 key criteria to assess the relevance and suitability of store assistance robots, as well as to establish the specific roles in which a robot would be particularly effective and accepted, according to the type of store, product and section.  $\rightarrow \underline{F}$ 

Information robots have a rightful place in large stores selling a wide range of goods, as they can provide information on the choice of products and guide customers in-store, as is the case with the OSHbot robot developed by Lowe's. The objective is clearly to save time, which remains one of the most frequently-cited customer experience improvement areas.

Robots are best adapted to products that do not require highly tailored human assistance or recommendations. They are therefore more suited to self-service products and less so to fresh or deli products, for which advice from sales staff is highly appreciated.

Sales staff working in complex product categories, such as electronics or DIY, with a high number of characteristics and features, could welcome the robot as a reliable and exhaustive relay of information. Collection of customer data can also enable robots to offer customized information adapted to the customer's needs.

Robots are less suited to the world of high-end products (luxury goods in particular), for which customer expectations from sales staff remain exceedingly high, even though robots can be an important vector of modernity. Nespresso stores are a perfect example of this balance between increasing digitization of stores and high numbers of staff to serve customers.



Lastly, robots can play a truly relevant role in the case of products requiring specific customization. Depending on the actual needs of customers, colors, sizes and models can be offered quickly by robots.

Stores/product categories with these characteristics, namely a wide product range, self-service, complex products, mid-range positioning and relatively personalized products, include DIY and electronic/ electrical goods stores where there is a strong need for information and advice and where customer support must be personalized. The OSHbot robot, launched in the Orchard Supply Hardware store in San José, California, is a good example of such use. Robots also play a particular role in the textile industry, due to the multiplicity of sizes and colors and the potential for recommending to consumers models that suit them, based on their purchase history. As for robots that greet and provide information, why not, if this frees sales staff from basic tasks to spend time instead on providing advice? By all means, provided they are not solely an entertainment gimmick but instead offer relevant and appropriate information, and are used only for specific product categories... and with the vital link provided by staff to finalize the sale!

# <u>A radical overhaul of</u> <u>customer experience</u> through virtual augmented reality.

Although welcome robots offer an interesting experience for customers, at best they are imitating human beings. The next real innovation in terms of customer experience is more focused on concepts of augmented or virtual reality, which do not merely imitate people, but offer a radically sensory experience. Augmented reality consists of enhancing the real world with virtual objects, whereas virtual reality bypasses the real world to immerse users in a fictional universe.

#### **IMMERSING CUSTOMERS IN 3-D**

Augmented reality technology, already used by a number of retailers, enables customers to add elements in 3-D to their familiar universe. IKEA has developed an application to peruse its catalogue in augmented reality, allowing customers to virtually install furniture in their homes, in their 3-D modeled living rooms. Certain optical retail chains allow customers to virtually try on glasses, giving them advice according to the shape of their face. Virtual fitting rooms are becoming increasingly widespread, either by creating an avatar of the customer from their photos and morphological features, or by scanning their silhouette in a mirror. Customers can then dress from head to toe without having to change and can see their reflection in a mirror or on a screen, wearing the selected clothes. In order to add real value and bridge the sensory deficit, virtual fitting rooms need to also offer customized clothing advice and suggest items according to taste

and the latest fashion. In this way they can offer customers a convincing and original experience.

## REACHING NEW DIMENSIONS WITH VIRTUAL REALITY

The application of virtual reality in video games offers an insight into retailing of the future. For example, virtual reality offers the public the chance to fly a plane (Flight Simulator) or stroll through a medieval village of the 15th century (Assassin's Creed).

Combining an experience that is both personal – the player is the protagonist – and sensory, on account of the feelings aroused by exploring unfamiliar surroundings, virtual reality radically overhauls the customer experience.

When applied to retailing, virtual reality offers considerable opportunities, since it can be used to extend the reach and portfolio of products on offer. Traditional travel agencies could take their clients on a virtual journey to the heart of their future destination, thus making partner hotels more attractive.

Virtual reality is also an exceptional tool for retailers, for creating pop-up sales areas and bypassing the constraints of costly retail real estate, thus enabling ranges of swimming pools, cars and furniture to be presented in a variety of colors and sizes in small sales areas.

The aim of virtual reality is also to provide customers with a unique "experience", beyond simple product contact, and invite them to engage with the environment associated with the brand. This is what North Face offers, for example – the chance for customers to virtually immerse themselves in a hike in California's Yosemite national park or on a dog sleigh ride.

Will the stores of tomorrow therefore be totally virtual? This is the choice recently made by eBay when launching the world's first virtual reality store, with 12,500 items available for perusal from the ease of your home, with nothing more than a headset. Does this mean stores will be rendered obsolete? Perhaps not, as virtual experience is only truly meaningful if it is combined with a sensory experience, the ability to touch certain products, move through a dedicated area and obtain customized advice.

### **AUGMENT**

Founded in 2011, this start-up has developed a number of solutions for brand names and companies based on augmented reality. The virtual reality application enables Augment clients to create 3-D simulations of their products in any environment. This provides a sales aid for sales representatives, who can then quickly and easily view products and display stands in the store.

#### Key clients

L'Oréal, Coca-Cola, Samsung, Salesforce, Kellog's



# Robots and customer service: <u>a significant</u> <u>reduction in in-store</u> <u>pain points.</u>

#### FROM TRADITIONAL CASH REGISTERS TO SELF-SERVICE PAYMENT STATIONS, WHAT IS THE IDEAL BALANCE IN STORES?

To remain attractive, physical sales outlets can reorganize customer experience to their advantage, providing they successfully manage traditional pain points, such as the time (often too long) spent in the store. It would be inefficient to introduce certain digital innovations, without having first reduced waiting times at cash registers and, more generally, the overall time spent in the store. Over the past 30 years in France, the average time spent shopping has increased by 47%, from an average of 40 minutes to 1 hour and 12 minutes, according to a recent Insee study. It is therefore essential for retailers to offer automated solutions that improve flow in the main store processes.

There have already been a number of improvements with respect to automatic checkout and over the past 10 years, stores have increased self-service payment/scanning mechanisms and experiences to offer their customers increased flexibility. Self checkout, self-service scanning, mobile shopping or payment directly to store sales staff are all robotic systems enabling customers to reduce time spent paying. Payment technology using RFID chips also improves the flow of the payment process, as used for example in Nespresso and Decathlon, even though the use of RFID labels represents a considerable investment for retailers (with a passive tag costing between 5 and 10 eurocents per label). Has the replacement of traditional cash registers by automated devices been fully accepted and adopted by customers? Are these devices really effective? It is interesting to note that self checkouts do not completely replace sales staff, since there is always an assistant nearby. A triangular relationship is established between the assistant, the machine and the customer, which enables such a system to function. As for handheld scanners, these are perceived differently by customers. By acting as an extension to their hands, they are fully accepted as part of the task to be performed.

A robot no more: rather, it is the "augmented" client that replaces the sales assistant.

The success of experiments in stores completely equipped with self checkouts is yet to be proven and they have instead been met with lukewarm commercial success. Some large supermarkets have made an almost complete switch to self checkouts (up to 40 out of the 50 total payment stations), but were not as successful as hoped and in the end decided to return to traditional checkouts. This failure is proof that customers wish to keep the choice between different checkout options, rather than having the sole option of a disembodied relationship with a machine.  $\rightarrow \underline{G}$ 

Finally, the issue of the balance between traditional checkouts, self checkouts and self-scanning, and the distribution of tasks between the customer, the store assistant and the robot, remains crucial and is yet to be fully resolved. Traditional checkouts currently still

## G

#### FEWER THAN 3.5% OF CASH DESKS ARE CURRENTLY AUTOMATED

Breakdown of the types of food cash desks in France

#### TOTAL NUMBER OF STORES



Source: Wincor, Roland Berger analysis

represent over 50% of payment solutions and self-scanning is more popular for large amounts of shopping. On the other hand, self checkouts are popular for small amounts as they are impractical for large loads.

The future probably lies in machines that integrate completely new features, such as the 3-D scanning of articles, as proposed by the Touchless Commerce system developed by Toshiba. Combined with a weighing algorithm, this system can be used to simultaneously scan all the products in a basket using a camera in 1.5 seconds (compared to around 3 seconds per item for checkout staff). In the meantime, the customer's iris is scanned for payment by another camera and they have nothing more to do. The 360° checkout tunnel scanner developed by Wincor and tested by Asda scans up to 100 articles per minute, promising enormous gains in time and productivity.

#### 100% AUTOMATED STORES, MYTH OR REALITY?

Are we heading toward entirely automated stores? Although payment is already almost totally integrated from a technological standpoint, and automated, product picking is the ultimate step to making stores fully robotic. This would involve customers avoiding any waste of time by no longer having to go and fetch their products, but with these being handed to them directly by robots instead. This may appear something of a fantasy and yet the start-up Hointer is already offering the service in a men's jeans store in Seattle. In this 100% automated store, clients scan the item of clothing (of which only one is on display), specify the desired size and color and then receive notification, inviting them to go to a fitting room.

A few seconds later, the item is delivered to the fitting room by a robot. If the customer wishes to change size or color, they can indicate this on a terminal and another item is sent. Finally, the customer can pay at one of the self checkout desks and leave the store without having met a sales assistant. Developed on the initiative of the former Supply Chain and Fulfillment Technologies Director at Amazon, Nadia Shouraboura, the concept is highly attractive. It aims to simplify the in-store customer experience by making it much faster and therefore similar to an e-commerce experience and is having a significant impact on the performance of this retailer.

## WHAT ARE THE BENEFITS OF A FULLY AUTOMATED STORE?

Should we conclude that fully automated/dehumanized stores are the stores of the future and that this will be accepted by customers? The response is complex and not universal, as it depends on the category of products, positioning of the brand and pricing levels. Luxury goods are unlikely to be sold in fully automated sales outlets as they require a high level of service and emotion that only a sales assistant can provide.

Full automation also appears difficult for complex technological products (electronics, for example) that require consultation with a sales assistant, even when all the information is available on digital terminals.

BestBuy, with its Chloe robot, is a good illustration. This New York electronic goods store experimented with a 100% automated concept, featuring an articulated arm fetching the items from an enormous range. It then placed the purchase in a mini-toboggan and sent it to the customer. The results were extremely disappointing, since customers were not at all attracted by this dehumanized concept, lacking any customer service.

Technical innovation replaced an even more powerful reality, namely the need for customer service, especially in a field where consumers expect advice and reassurance.

So, the answer is yes, automated stores herald the stores of the future – but only for products where customers' expectations mainly focus on fluidity and rapidity, rather than a personalized experience...

### <u>HOINTER</u> PRODUCTIVITY GAINS

Reduced in-store stock; optimization of sales area (5 times smaller than a traditional store)

Reduced staff costs (-50%)

Flow optimization by NFC tracking of each item

Positive impact on sales (trying on of 12 articles compared to an average of 3-5)

Marketing campaign via the store's mobile application

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# Customer path analysis: more accurate tracking.

#### E-COMMERCE RETAILERS ARE AHEAD IN THE BEHAVIORAL ANALYSIS OF THEIR CUSTOMERS

The omni-channel strategy of the various retail players is now obliging them to completely rethink their observation models and the way in which they analyze client paths, which, until recently, was little developed in physical retailers.

Traditionally, data tracked and analyzed by retailers came from loyalty cards, coupon use, mailing feedback and analysis of purchase receipts. Panels are used to uncover key trends, purchasing behavior and the socio-demographic profiles of consumers. Most retailers were therefore content to analyze the static paths of customers, which ended at the cash register or with finalization of the purchasing process, without taking into account a comprehensive, multi-channel and customized analysis.

E-retailers, on the other hand, deprived of sales staff to observe customers in-store, have spent the last 10 years developing customer behavior analysis mechanisms using AB Testing, tracking or semantic analysis, especially on social networks, to be more effective in recruiting and increasing loyalty among their customers.

These developments have contributed to widening the gap between the understanding of online and offline customer paths, enabling e-retailers to make more personalized proposals.

#### IN-STORE ANALYTICS TRACKING, REAL PROGRESS FOR PHYSICAL SALES OUTLETS

Having shifted their focus to the development of their web presence and through exposure to the essential analytical tools associated with it, retailers have now started optimizing their sales outlets, which still represent between 70% and 90% of total sales. They have endeavored to implement innovative solutions for tracking and analyzing customer paths, as well as integrating the need for internal reorganization to create dedicated marketing intelligence departments that can process significant quantities of data. This new imperative for traditional retailers to leverage "big data" has led to the rapid development of certain physical tracking tools in stores.  $\rightarrow H$ 

The widespread introduction of sensors in retail outlets, featuring increasingly advanced technology, has also provided ever more relevant information for these players, who now have to rethink their marketing strategies. The most innovative of these retailers operate 3-D sensors that track the entire paths of customers, from their arrival in the store to the payment process, like those offered by the young French company, Digeiz. These sensors include a considerable number of features, making it possible to count customer numbers (customer flow past the window, into the store – both per zone and as a total) and calculate stopping times and orders of visit, as well as to analyze local conversion rates and non-conversion paths. →

The American retail chain Nordstrom, which specializes in clothing and footwear, has equipped itself with technology of a slightly different type. Developed by the company Retailnext, it simply tracks and analyzes in-store customer behavior using the stores' wifi facilities, detecting the presence of a smart phone and its position within the sales outlet.

Telephones emit signals with a single identifier (MAC address) and other non-personal information that the company can then analyze and reproduce in a simple form. It can also create a thermal map of the store, showing the "hot" and not-so-hot areas, and identify the key characteristics of customers (gender,

## DIFFERENT FORMS OF TECHNOLOGY FOR OBSERVING CUSTOMER FLOW IN STORES

Technology	2-D cameras	3-D cameras (local or global)	Beacon/ Bluetooth	Wifi	Ultrasound
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Offers	Analytics	Analytics	Analytics & Customer Interaction	Analytics & Customer Interaction	Analytics & Customer Interaction
Advantages	Option of using surveillance cameras Non-intrusive	Exhaustive and accurate Dynamic data Automated analysis possible Non-intrusive	Customer interaction (push, advice) Dynamic data Simple to install Mobile behavior crossover (application)	Dynamic data Simple to install Enhancement of information possible (profile, online behavior, etc.)	Dynamic data Simple to install
Limits	Static data Installation required Direct customer interaction impossible	Direct customer interaction impossible Installation required	Low accuracy (~3m) (depending on the store structure/ facilities) Non-exhaustive (5-20% of people): application & BT enabled	Low accuracy (~5m) (depending on the store structure/ facilities) Non-exhaustive (30% of people): wifi enabled Intrusive	Low accuracy (~10m) (depending on the store structure/ facilities) Non-exhaustive (5% of people): enabled application required

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#### ANALYSIS OF STORE TRAFFIC

#### EXAMPLE OF A DIGEIZ REPORT



🛑 Low traffic 🛛 🚽 🚽 Dense traffic

age and type) by means of a powerful video analysis system (eye tracking). These sensors and the collected data have multiple applications:

Firstly, they can have a significant operational impact through optimization of staff allocation according to the time of day and areas in the store.

Secondly, they have implications for marketing/ merchandising, with the possibility of creating specific traffic areas depending on the number and type of customers, as well as the development of targeted campaigns.

They also provide a commercial opportunity, since this data can be exploited to optimally enhance areas popular with customers. Lastly, the key advantage of these devices is to be able to reconstitute the whole path of a customer, from the time spent in front of the window to inside the store, and to define standard customer paths and segmentation. Probabilities and statistics can then be drawn up according to customer behavior: for example, if they spend more than 5 minutes in a specific section, there is an 80% chance they will buy an article from this section. This is simply a mathematical modeling of customer behavior based on store data, yet the impact on sales is significant!

#### ANALYSES OF CUSTOMER EMOTIONS IN-STORE: THE FINAL STAGE OF UNDERSTANDING, BUT WHAT ABOUT ACCESS TO PRIVATE DATA?

When customers enter a store, they may feel a range of emotions when faced with the goods on display, the special offers they see and the theatrics used by the store. The emotions they feel are shown by "micro-expressions", in other words voluntary and involuntary movements of facial muscles, which indicate the emotional state of the consumer, whether happiness, surprise, anger, weariness, etc.

Sales staff are supposed to be there to decode these expressions and provide the most appropriate response. However, they obviously cannot see everything... And this is where robot sensors come into play.

Indeed, robots are now increasingly able to recognize these micro-expressions and associate them with specific individuals, as can be seen with Eyeris, an American company which has developed a system to analyze emotions named Emovu, aimed at offering more relevant products and personalized customer experiences. This is what the company refers to as the development of ambient intelligence, which is in fact a situational analysis with an adapted response.

This observation does, however, bring up the highly-sensitive issue of the protection of personal data and privacy, the same subject that caused much debate with the advent of Internet and e-commerce. Except that in the case of stores, no explicit permission is sought from customers and it is difficult to persuade them to accept the tracking of actions, gestures and emotions.

Indeed, according to an Opinionway survey, only 23% of US consumers are prepared to approve this type of practice. Why is it that customers accept this in the case of e-commerce, but not in that of physical retailers? On Amazon's site, an implicit deal is offered to the customer, namely that personal data is collected in the interests of a highly-personalized customer experience, with significant added value (powerful recommendation algorithm and special offers specifically adapted to their requirements, etc.). In stores, the service is still far from reaching this level and distrust is based on the risk of manipulation marketing or even discrimination related to physical appearance.

### **SENSOR FEATURES** [IN ORDER OF RETAILER BENEFIT]

Customer count Path tracking Behavior analysis Attention analysis Emotion analysis



Whether curious, fascinated or bewildered, customers are far from being indifferent to the arrival of in-store robots. Is it just a fad, accentuated by short-lived media coverage, or is it – as in Japan – a real, deep-seated trend?

From welcome robots to robots observing and analyzing customer paths, these innovations are bringing real benefits, boosting customer experience, reducing costs and optimizing in-store space management. To such an extent that in the future, we could be designing stores where robots are an integral part of the concept and play a role throughout the customer's experience.

It's not difficult to imagine consumers going to a store to buy some shoes, being greeted by a welcome robot, which would direct them to the required section in their own language. Then they would look at shoes displayed in a limited retail area, and view other models using a virtual reality headset, before informing a preparation robot of their choice. The pair of shoes would then be delivered directly to the fitting room. Payment would be made by self checkout, watched by intelligent sensors that have tracked the customer's path since they arrived in the store and are able to calculate the conversion rate in real time!

However, for their use to be widespread in the stores of the future and to satisfy our imaginations, robots will have to prove themselves. They need to demonstrate their operational efficiency, which must justify the initial investment recouped through cost savings (space, staff, shrinkage) or an increase in traffic and revenue. To achieve this, the cost of robots must continue to fall, while offering increasingly perfected functions.

With improvements in artificial intelligence technology, welcome robots will move on from simple customer interaction to customized recommendations: featuring facial and voice recognition, enhanced response scenarios, as well as interpreting and reacting to emotions. Store structures must also be reviewed and optimized. For example, stock areas must be better organized, reducing the complexity of trips, to enable an inventory or picking robot to be effective in its control or restocking task. The format of stores also needs to change to make life easier for robots... and therefore for customers.

In order to become an integral part of the landscape, robots must be accepted culturally both by the general public and by store employees. Although certain cultures, such as the Japanese, have rapidly developed empathy with robots, a great deal of education is needed in Europe, possibly extending to the introduction of a new, simpler form of language that would enable humans to communicate with robots in an optimal manner.

The extent to which robots are accepted will be a key factor in their integration in stores, thus defining the extent of human presence (partial or complete substitution) alongside customers and enabling a better working partnership between employees and robots. This acceptance will also depend on the appearance of robots, where the right balance (half-human and half-machine is still to be found.

Finally, although robots need to adapt to mankind, it is also essential that mankind adapts to robots. The issue of the extent of this adaptation naturally arises if we imagine both sides in the future taking part together in store service meetings and even reaching agreement with each other prior to taking important decisions.

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**OTHER PUBLICATIONS** 

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