AUGMENTED REALITY IN LOGISTICS

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The next big wave of change in the logistics industry might just come in the form of Augmented Reality technology.

From personal computers to mobile devices, we know that technology can profoundly alter the way we communicate and interact with the world. New technologies impact almost every industry, and logistics is no exception.

The potential for Augmented Reality in the logistics industry has already been highlighted in the acclaimed ‘DHL Logistics Trend Radar’. This overarching study is a dynamic living document designed to help organizations derive new strategies and develop more powerful projects and innovations.

This trend report intends to deepen your understanding of Augmented Reality and answer the key questions:

- What is Augmented Reality all about?
- How far has this technology developed; are there some examples of best practice?
- What are the implications for Augmented Reality in the logistics industry?

Jointly developed with Z_punkt the Foresight Company, a specialty consultancy for strategic future planning, trend analysis, and new technologies, this report goes beyond the recent media hype to offer real-world use cases, revealing what’s going on now, and what’s likely to happen in the future.

We hope that ‘Augmented Reality in Logistics’ sparks your interest and enthusiasm for this exciting, emerging topic and provides you with new insights. Thank you for choosing to join us on this journey, which we believe is about to take off shortly.

Yours sincerely,

Matthias Heutger
Dr. Markus Kückelhaus
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Imagine your car breaks down in the middle of the highway. You know very little about vehicle mechanics, and the next garage is miles away. Today, this breakdown is likely to cost you lots of time and money to fix; but tomorrow, it may be no more than a minor glitch in your day. Using your smart glasses, you’ll be able to launch your repair app and assess the problem through your normal line of sight accompanied by a step-by-step repair guide for your particular make and model of car, without the help of a mechanic.

Or imagine you’re out shopping, and want to know how other consumers have rated a jacket that you’re thinking of buying. By glancing down at the product with your smart glasses, you’ll instantly see extra information displayed alongside the jacket – user ratings, product price range, and supply information – all of which empowers your purchasing decision.

This is Augmented Reality (AR) – where every object you see could be enriched with additional and valuable information. AR is defined as the expansion of physical reality by adding layers of computer-generated information to the real environment. Information in this context could be any kind of virtual object or content, including text, graphics, video, sound, haptic feedback, GPS data, and even smell. But AR is more than a simple displaying technology. It also represents a new type of real-time natural user interface for human interaction with objects and digital devices.

AR is made possible by performing four basic and distinct tasks, and combining the output in a useful way.

1. **Scene capture:** First, the reality that should be augmented is captured using either a video-capture device such as a camera, or a see-through device such as a head-mounted display.

2. **Scene identification:** Secondly, the captured reality must be scanned to define the exact position where the virtual content should be embedded. This position could be identified either by markers (visual tags) or by tracking technologies such as GPS, sensors, infrared, or laser.

3. **Scene processing:** As the scene becomes clearly recognized and identified, the corresponding virtual content is requested, typically from the Internet or from any kind of database.

4. **Scene visualization:** Finally, the AR system produces a mixed image of the real space as well as the virtual content.

Experts also differentiate between Augmented Reality and Virtual Reality (VR). VR is a completely computer-generated, immersive and three-dimensional environment that is displayed either on a computer screen or through special stereoscopic displays, such as the Oculus Rift. In contrast, AR (or Mixed Reality as it is also sometimes called) combines both the virtual and the real. Users of AR are still able to sense the real world around them; this is not possible when people are immersed in VR.

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1.1 From Digital Gimmickry to Revolutionizing Business?

Despite the surge in widespread media coverage over the past 12 months, the majority of AR solutions that we read about today are still in development. Only a few hardware solutions are being mass produced and readily available to purchase off the shelf.

Just a couple of years ago, there were only a handful of available commercial AR applications – in fact the first AR app for the iPhone was not released until 2009.\(^2\)

In 2011, global AR revenues were as low as USD 181 million\(^3\) and, at that time, AR was often perceived by the public as just a marketing gimmick: a technology in search of a useful application. There was little public awareness, and applications were primarily developed to gain quick PR wins, or their value was limited to attention-grabbers such as adding video effects.

However, latest forecasts predict that by 2017 the AR market will grow to USD 5.2 billion – an impressive annual increase of almost 100%. With substantial funding being poured into AR projects and start-ups, especially by large corporations such as Google, Canon, and Qualcomm, we can expect the first significant wave of consumer-ready AR products to be launched over the next 12 months. And with concrete business benefits coming to light, experts are convinced that AR will be the ‘next big thing’ in the consumer, medical, mobile, automotive, and manufacturing markets.\(^4\)

AR is no longer just a marketing ploy. We will see continued uptake of AR and, as it grows, its application will be accelerated by technological progress.

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1.2 Hardware Overview

By looking at the types of AR platform currently available, and predicting what lies ahead, the following AR items can be identified today:

- Handheld Devices
- Stationary AR Systems
- Spatial Augmented Reality (SAR) Systems
- Head-mounted Displays (HMDs)
- Smart Glasses
- Smart Lenses

Handheld Devices

We are currently experiencing a massive boom in Handheld Devices such as smartphones and tablet computers, and this will accelerate AR adoption. These devices are appearing with ever-better features such as higher-resolution displays, more powerful processors, and high-quality cameras, along with a growing array of sensors providing accelerometer, GPS, and compass capabilities, making them very suitable AR platforms. Although handheld devices are the easiest way for consumers to access AR apps, most are not wearable and so they cannot give users a hands-free AR experience.

Stationary AR Systems

Stationary AR Systems are suitable when a larger display or higher resolution is required in a permanent location. Unlike mobile AR devices, these motionless systems can be equipped with more advanced camera systems and can therefore provide more precise recognition of people and scenes. Moreover, the display unit often shows more realistic pictures and is not so much affected by environmental influences such as sunlight or dim lighting.

Spatial Augmented Reality (SAR) Systems

In contrast to all other systems, Spatial Augmented Reality (SAR) Systems include virtual content directly projected on top of the real-world image. SAR systems are frequently stationary in nature. Any physical surface such as walls, desks, foam, wooden blocks, or even the human body can be turned into an interactive display. With projectors decreasing in size, cost, and power consumption, and with progress in 3D projection, what’s emerging is a completely new range of interaction and display possibilities. The biggest advantage of SAR systems is that they provide a more accurate reflection of reality, as virtual information can be visualized with actual proportions and size. Furthermore, content can be made visible to a larger number of viewers, and this can for example enable simultaneous working.

Figure 3: Smartphone Example of a Handheld Device; Source: Freshmindstalent

Figure 4: Stationary AR Wardrobe at a Topshop in Russia; Source: Mashable

Figure 5: SAR System at Volkswagen; Source: Volkswagen
Head-mounted Displays (HMDs)

Head-mounted Displays (HMDs) represent another rapidly growing AR hardware item. HMDs consist of a headset, such as a helmet, which is paired with one or more (micro-) displays. HMDs place images of both the physical world and virtual objects over the user’s field of view. In other words, the user does not see reality directly, but sees an (augmented) video image of it. If the display is placed only in front of one of the user’s eyes, it is called a monocular HMD (in contrast to binocular systems, where both eyes view the display). Modern HMDs are often capable of employing sensors for six degrees of freedom (allowing the user to move their head freely forward/backward, up/down, left/right, pitch, yaw, and roll). This enables the system to align virtual information to the physical world, and to adjust according to the user’s head movements.

Smart Glasses

Many companies from the consumer electronics industry are expecting Smart Glasses to be the next global consumer hit after smartphones. These AR devices are in essence glasses equipped with screens, cameras, and microphones. With this concept, the user’s real world view is intercepted and an augmented view re-displayed in the user’s field of vision. AR imagery is projected through or reflected off the surface of the eyewear lens pieces. The most prominent examples of this technology are Google Glass and Vuzix M100. However, one of the most exciting smart glasses developments today is the Atheer One – these smart glasses are equipped with 3D depth sensors, allowing users to physically control the virtual content displayed in front of them.

Smart Lenses

Glasses are certainly not the end of the story. Research is gaining momentum into Smart Lenses that can display AR imaging; companies such as Microsoft and Google are busy unveiling their own smart lens projects.

The idea is to turn conventional lenses into a functional system by integrating control circuits, communication circuits, miniature antennas, LEDs, and other optoelectronic components. In future, hundreds of integrated LEDs could be used to form an image directly in front of the eye, transforming the lens into a display. However, before this can become reality, a couple of significant challenges must be overcome, such as how to power the lenses, and how to ensure that the human eye is not damaged.