WHITE PAPER

Electronic Shelf Labels are Center Aisle in the Store of the Future

DIGITAL STORE INITIATIVES ARE DRIVING WIDER ADOPTION OF ESL

"Consumers are growing more price-sensitive and price-aware, increasing the need for smooth price changes and fueling demand for retail automation solutions like electronic shelf labels."

(STRAITS RESEARCH)[1]

Consumers' expectations for in-store experiences have dramatically changed post-pandemic and shoppers are demanding faster, safer, contact-free shopping experiences. They are more aware of how they interact with stores at which they shop, looking to enhanced product visibility, streamlined checkout and a full range of curbside and delivery options beyond the four physical walls. There is also an expectation that the in-store experience and product prices should match or go beyond the online experience, straining existing capabilities that are challenging physical retail conventions. In short, consumers are demanding digital experiences at every touchpoint.

As digital store initiatives proliferate, interest in electronic shelf labels (ESL) has grown. Why? This technology provides real advantages for the retailer and enhances the consumer's experience.

What are ESLs?

Electronic shelf labels (ESL) are small, battery-powered electronic paper (e-paper) displays that present product and pricing information at the shelf edge, replacing paper labels. ESLs use wireless technology to communicate with a central hub to form a dynamic pricing automation network.[2]

Typical use cases include:

- Price Management
- Inventory Management
- Product Information
- Promotions and Offers
- Proximity Services
- Order Picking

80%

decrease in time spent on price updating[5]

788 million

total ESLs installed globally by the end of 2022[6]

3 billion

cumulative ESLs will ship by 2028[6]

Increasingly, ESLs are becoming more intelligent and supporting technologies such as color displays for animated information by beacons that use Bluetooth® technology for proximity services, QR codes, and near field communications (NFC) for consumer interaction and engagement. Future enhancements also include sensor integration, LED-flashing, and even computer vision.[3]

Retailer and Shopper Benefits

The biggest benefit for a retailer is labor savings. Assuming a store has 3,000 price changes per week, ESLs can save up to 5,200 hours per store annually.[4] They also offer enhanced merchandising opportunities by providing better views of pricing data, inventory, and out-of-stocks. Newer ESLs can include sensors to monitor aisle traffic patterns that help with planograming (store layout), promotions and product displays. Replacing paper pricing with e-paper powered, energy-efficient, long-lasting battery systems also delivers a sustainability benefit.

Whether online or in-store, price transparency and parity is a key benefit to the consumer and builds trust. As online retail provides a plethora of product information, now so can the brick-and-mortar store. ESLs can offer additional product and stock information, product reviews, multiple currency pricing, and allergen and nutritional information to help conversion rates. When combined with location analytics and the consumer's mobile device, ESLs can guide them to related items and promotional offers, recommend other products, and even price-check against the competition.

Demand for ESLs is Growing

With tens of billions of paper labels globally, the opportunity for retailers to benefit from ESLs is enormous. However, only 788 million ESLs are in stores today, which means that ESL vendors have access to a huge addressable market that has scarcely been tapped.

As ESL prices decrease and more capabilities are added, the demand across all retail segments should increase. Despite this, to date, the ESL market is comprised of a few competing end-to-end solutions that typically use proprietary technology and are often use-case specific. That era is going away.

Retailers are reluctant to lock themselves into a single, specific technology that may or may not support other digital initiatives and is difficult scale. This is forcing many retailers to partner with multiple ESL vendors to avoid technology lock-in and explore which technology is best for their specific use case.

Increasingly, retailers and vendors alike are embracing standards-based technology from organizations such as 3GPP, Bluetooth® SIG, IEEE, Wi-Fi Alliance, FiRa Consortium, and NFC Forum, among many others.[3]

Standardization is the Key to Adoption

Up to now, the market was led by a few ESL vendors offering proprietary 2.4 GHz and sub-1 GHz, Wi-Fi, Bluetooth®, infrared, mid-infrared communications, Zigbee, Thread, NFC (for proximity), RFID, and LoRaWAN, as their main connectivity technology.[3] Most of these included proprietary dongles as the mechanism to connect the ESL through a wireless access point to their cloud services.

"I am optimistic that electronic shelf label technology will be adopted more broadly as price and product transparency become more important for the consumer and in-store process automation becomes essential in store operations."

LESLIE HAND,
GVP OF IDC RETAIL AND FINANCIAL INSIGHTS[9]

However, the times are changing. Retailers are now demanding standard protocols that can be used with other digital store initiatives. Standards such as Bluetooth® Low Energy (BLE) and Thread enable secure, bi-directional communication between a wireless access point (AP) and thousands of very low-power end nodes. By using standards-based technologies for all their digital store initiatives such as ESLs, asset tracking, touch-free checkout, loss prevention, and wireless sensor networks, this interoperability means that retailers can pick the right solution for their specific use case and maximize their ROI (return on investment).[7] In fact, Bluetooth® SIG has recently introduced the Bluetooth® Electronic Shelf Label standard to address multi-vendor interoperability.[8]

Looking Forward

As more and more retailers turn to ESL solutions, they can leverage their existing infrastructure and rely on standards used in other in-store solutions, rather than running a separate network for ESL. Extreme networking solutions are purpose-built for unique business needs and specific physical challenges in retail. Extreme Networks 6 GHz Wi-Fi innovation (Wi-Fi 6E and soon Wi-Fi 7) supports IoT radio standards including BLE, Thread, Zigbee and others.

With the Extreme Universal Wireless portfolio, retailers can take advantage of the latest technology innovations. The portfolio is designed to deliver time-saving operational efficiencies to IT teams and ensure best-in-class user experiences. Extreme wireless networks provide flexibility, enabling organizations to deploy across any use case, whether they require on-premises or cloud management, or a combination of both. With built-in IoT radios, Extreme wireless access points are engineered to support several types of ESL technologies, saving time and money in deployment.

To support operations, business insights are provided with built-in guest, location, IoT, and security applications within the existing ExtremeCloud™ IQ management platform. ExtremeCloud IQ CoPilot provides AIOps and Explainable ML (machine learning) capabilities, empowering IT teams with actionable insights to proactively improve network performance and user experience.

Extreme Networks can help retailers through efficient management tools and by supporting current and future digital initiatives, including ESL, AR/VR experiences, automated checkout, temperature sensors, and more, that hat boost the delivery of better customer experiences as well as business efficiencies. And, Extreme Networks infrastructure is flexible and adaptable, which means technical integrations with third-party hardware and software are relatively seamless. With Extreme Networks, the store of the future is now.

Learn more about the Extreme Universal Wireless Access portfolio.

1 Straits Research, "Electronic Shelf Market Size, Trends and Supplier to 2030," 2022.
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4 Forrester Research, "A Forrester Total Economic Impact™ Study Commissioned by Pricer," December 2023.
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6 ABI Research, "How the Bluetooth® Electronic Shelf Label Standard Will Impact the Smart Retail Market," 2023.
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8 Bluetooth®, "Electronic Shelf Label Standard."
9 IDC, "IDC TechBrief: Electronic Shelf Labels," May 2023, # US50083723.

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