



## CASE STUDY

# Brewing the Future of Smart Retail with ASUS IoT Industrial Solutions

## From Traditional Cafés to Unmanned Service

The coffee industry has long been defined by the craftsmanship of baristas behind the counter. Yet in high-traffic venues such as train stations, airports, and business districts, the challenge has always been striking a balance between efficiency and quality. While vending machines offer convenience, they lack the adaptability and precision of a skilled barista. The demand for a smarter, fully unmanned alternative has been steadily rising.

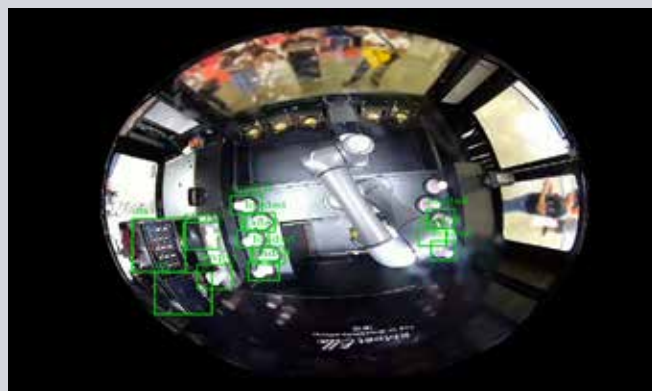
Ella, the robot barista developed by Singapore-based Crown Digital demonstrates how physical AI is transforming retail and hospitality – bringing autonomous, consistent and scalable service to real-world, high-traffic environments. More than just a machine, Ella is a complete AI-driven system that combines robotics, AI vision inspection, and industrial-grade embedded hardware to deliver a high-quality, contactless, and fully automated coffee experience. Recently, Ella has been upgraded to include powerful solutions from ASUS IoT – ready for global-scale rollout and adoption.

## Overcoming Development Challenges

Developing Ella required overcoming several challenges inherent to unmanned retail. The system needed to integrate high-performance computing within a compact enclosure, remain reliable under 24/7 operation, and process AI workloads at high speed. Beyond performance, accuracy and consistency were paramount – consumers would only embrace unmanned cafés if they could trust the quality of every single cup.

## ASUS IoT's Complete Solution

Meeting these challenges required a complete solution that blended industrial-grade hardware, intelligent software, and cloud integration. Crown Digital provided the vision of an unmanned café, while ASUS IoT delivered the enabling platform – from hardware and AI software to system integration, testing, and long-term support. This partnership accelerated Ella's journey from concept to scalable deployment.



At the hardware level, Ella runs on the ASUS IoT EBS-A710 industrial chassis paired with the Q670EA-IM-A industrial motherboard. Equipped with an Intel® Core™ i7 processor and accelerated by an NVIDIA RTX™ 4000 Ada GPU, this platform delivers robust compute performance for AI inference while ensuring thermal stability and long-term reliability. Purpose-built for 24/7 operation, it maintains performance within a temperature range of 0° to 40°C – an essential requirement for compact, unattended retail environments.

“At Crown Digital, we’re deploying real-world physical AI that transforms how people experience retail and hospitality,” said Keith Tan, Founder & CEO of Crown Digital. “Ella is our vertically-integrated, fully-autonomous robot barista and the first step in a much larger platform vision where robotics and AI deliver consistent, intelligent, and engaging service at scale. With ASUS IoT’s industrial foundation, we’re not just proving what’s possible, we’re building the future of physical AI.”

## Intelligence Behind Every Cup

On the software side, ASUS IoT’s AISVision provides the intelligence that ensures Ella’s precision. Functioning as the system’s ‘eyes,’ AISVision leverages multiple IP cameras to monitor every stage of the coffee-making process – from cup placement and liquid levels to ingredient availability and machine status.

Four dedicated AI models enhance reliability: one tracks the control board’s operational status, while the others detect cup presence, foreign objects, and supply levels. When anomalies such as a misaligned cup or potential spill are detected, AISVision instantly alerts the control system, enabling the robotic arm to take corrective action. With detection accuracy up to 99% and inference times under 20 milliseconds, Ella delivers a consistent, reliable experience for every customer.

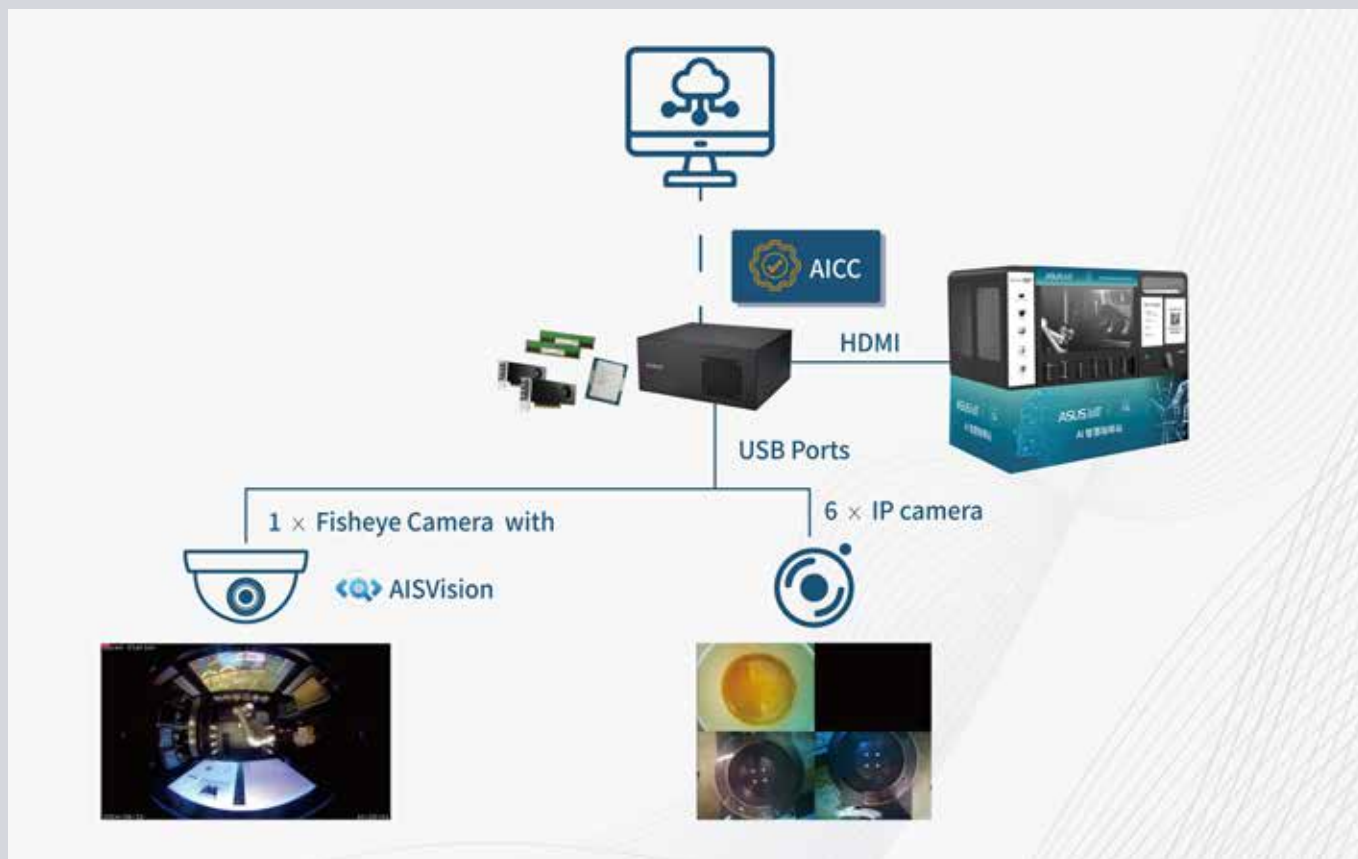
To further enhance engagement, Ella integrates an interactive transparent screen that serves both as a live viewing window during brewing and a digital signage platform when idle, creating a seamless blend of functionality and brand presence.

## Cloud-Enabled Smart Operations

Completing the solution is the ASUS IoT Cloud Console (AICC), which integrates Ella into a connected, data-driven retail ecosystem. AICC consolidates device data from multiple subsystems, performs encrypted analytics, and enables real-time operational insights. Operators benefit from predictive maintenance, inventory optimization, and remote monitoring, transforming Ella from a standalone coffee robot into a scalable platform for smart dining and unmanned retail environments.

## Brewing Impact Beyond Coffee

Ella demonstrates how AI vision – once primarily applied to manufacturing inspection – can redefine industries far beyond factory floors. By linking edge AI systems with AISVision, ASUS IoT enables businesses to extend automation with predictive alerts, supply monitoring, and equipment diagnostics. This reduces the burden of manual oversight while improving efficiency, reliability, and scalability across retail, logistics, and hospitality.



## Conclusion

With Ella, ASUS IoT showcases how the fusion of industrial-grade hardware, intelligent AI vision, and cloud connectivity can transform service operations. More than just a robot barista, Ella represents a proof point of how AI-driven automation can deliver precision, adaptability, and consistency – paving the way for smarter, autonomous operations across multiple industries.

## About Crown Digital

Crown Digital is a Singapore-based deep tech company pioneering the era of physical AI. Creator of Ella, the world's first vertically integrated, fully autonomous robot barista, Crown Digital is building a scalable platform that brings robotics and AI out of the lab and into everyday life. With proven deployments across airports, train stations, business districts, and corporate campuses, the company is redefining how retail and hospitality services are delivered in the real world. By uniting robotics, AI, industrial design, and vertically integrated supply chains, Crown Digital is not just transforming coffee, it is establishing the foundation for physical AI platforms that will power the next generation of retail and service automation globally.



▸ EBS-A710 industrial chassis



▸ Q670EA-IM-A industrial motherboard



▸ AISVision 365

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