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**Building Smart Business and City with Internet of Things**

**A Collection of IoT Application in Hong Kong**

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**Hong Kong**

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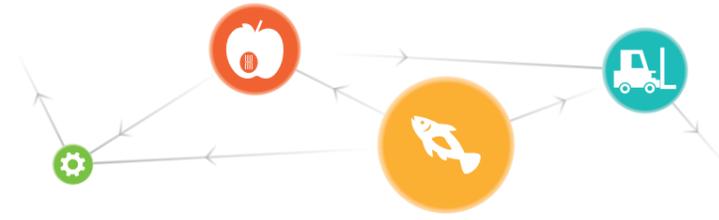
# Message from Hong Kong Internet of Things Industry Advisory Council

Years ago, who could have foreseen a scenario in which objects, animals and people are given unique identifiers and traceable online without human interaction?  Today, the Internet of Things (IoT) is making all these happen, promising improvements to almost every aspect of life while opening up a host of new opportunities for enterprises, governments and consumers.

IoT is emerging as the next technology mega-trend, with repercussions across the business spectrum.  In 2013, the Hong Kong Internet of Things Industry Advisory Council was formed by like-minded companies under the auspices of GS1 Hong Kong aiming to promote IoT innovations and broaden their adoption to uplift the competitiveness of local enterprises, and foster an IoT ecosystem for the continuous growth of this game-changing technology in Hong Kong.

On one hand, we share strategic advice with the HKSAR Government on IoT developments and the linkages with the mainland and international IoT bodies and organizations for technology exchanges. On the other hand, we provide strategic directions for GS1 Hong Kong on key IoT-related initiatives, including the Hong Kong RFID/IoT Awards, Hong Kong Internet of Things Centre of Excellence and Hong Kong IoT Maturity Model.

Despite its promise to evolve the way the world does business, IoT has been a mystery when it comes to real-life application.

Fortunately, by collaborating with GS1 Hong Kong, we have identified a considerable number of successful IoT projects through the Hong Kong RFID Awards and the Hong Kong Internet of Things Awards in previous years.  Real excitement came when we got to know how far these companies have gone in optimizing their business with groundbreaking IoT solutions.

This casebook not only showcases IoT innovation and excellence through 16 inspiring stories, but also synthesizes inventive ways of thinking for empowering robust IoT development in different sectors.  By reading the stories, you will be amazed by the unprecedented values IoT brings to the world and how it is shaping a sustainable future for our personal and professional lives.

All things are possible until they are proved impossible and even the impossible may only be so as of now. The Best Smart Hong Kong Award will continue to serve as a catalyst to stimulate innovative implementations and champion the development of new IoT solutions in Hong Kong in support of the Government's long-term Digital 21 Strategy and blueprint for the territory's ICT development.  Looking forward to seeing more big ideas in the future!

**Robert Burton**

*President,* Hong Kong Internet of Things Industry Advisory Council

*Executive Vice President,* Li & Fung Trading Ltd.

# Message from GS1 Hong Kong

The Internet of Things (IoT), described by Goldman Sachs as "the third big wave" of the Internet, is dramatically transforming the way we live and work and the ways in which business can utilise it across all aspects of the supply chain. IDC estimated that there will be 26 times more connected things than people in 2020. Gartner also expected that IoT product and service suppliers generate incremental revenue exceeding USD$300 billion by 2020.

With the tremendous opportunities offered by IoT, local enterprises should be well prepared to capitalise on this technology for sharpening their competitive edge and reinforcing Hong Kong's position as the regional leader in ICT.

In 2013, GS1 Hong Kong established the Hong Kong Internet of Things Centre of Excellence as the only local IoT showroom to accelerate knowledge exchange, industry adoption and innovative creation of IoT technologies. This initiative has received massive support from the HKSAR Government as well as the industries, technology partners and organizations which championed IoT. More encouraging, recent years saw many good practices of applying IoT enabling technologies in different areas to boost business performance and customer satisfaction and to address challenges in daily life.

These remarkable cases not only offer role models to illustrate how businesses went the extra mile in IoT, but also demonstrate the unprecedented innovation and dedication of local enterprises in converging IoT, big data and public sector information to enable better predictive analytics for both business and the society, and at the end, realise a smarter Hong Kong, smarter living.

To learn from the best, we are publishing this casebook that seeks is to provide an understanding of pragmatic approaches to IoT through outstanding references, including winning cases from the Hong Kong RFID Awards 2008-2013, the Hong Kong Internet of Things Awards 2014 and the Best Smart Hong Kong Awards 2015 in the past eight year as well as other illuminating examples from various sectors. Apart from profiling the leading-edge efforts by top performers, it also serves as a window into the way IoT works for smarter business and better life.

I would like to applaud the enterprises and organisations for sharing their success stories and insights to help produce this critical resource for industry practitioners who are interested in widening their horizons in IoT. This will certainly encourage more innovative original IoT application development in the territory.

Imagine a world where everything is traceable, identifiable and connected to the Internet together, these connections may not only change how we see the world, but also how the world sees us. Let's stand together and strive for a bright digital future!

**Anna Lin, JP**
*Chief Executive,* GS1 Hong Kong

# What is Internet of Things?

The Internet of Things is no longer a "fiction" in a novel, it is happening now.

The Internet of Things refers to any smart interconnected devices (e.g. RFID, sensors, etc.) that enterprises or organisations have adopted to obtain more visibility of the identification, location, and condition of products, assets, transactions, or even people. The ultimate goals are to be able to trace pedigree and to drive more effective, timely business decisions or to improve customer interactions. According to Goldman Sachs' report, the IoT is the third wave in the development of the Internet, with the potential to connect 10X as many (28 billion) "things" to the Internet by 2020.

Imagine a world where everything is traceable, can be identified and everything is connected to the Internet together. Such connections may change how we see the world, how the world sees us, and how we work together with these smart objects to make smarter business and better life.

For instance, businesses may no longer run out of stock or generate waste products, as the parties involved would know in real time which products are required and consumed. With the many benefits already promised and those yet to come, adoption of the Internet of Things will serve as the catalyst to bring about sustainability, growth and profitability to enterprises and organisations.

Like something out of a sci-fi movie, the Internet of Things promises to transform our daily lives. Your plants will text you when they need to be watered. Your coffee maker will brew a stronger cup when your bed transmits data that you didn't sleep well last night. Your child can make friends with children on another continent with an Internet connected to a toy. Your daily life in future will be well taken care by these smart objects, which sounds great, right?

Let's get started to understand and embrace the advancing Internet of Things enabling technologies now.

# About Hong Kong Internet of Things Centre of Excellence

Hong Kong Internet of Things Centre of Excellence (" The IoT Centre ") was set up by GS1 Hong Kong at the Hong Kong Science Park in 2013 and is supported by the Innovation and Technology Commission of the HKSAR Government, Hong Kong Science & Technology Parks Corporation as well as the industries, technology partners and organisations which championed IoT. The IoT Centre has been well renowned as the only showroom in Hong Kong to provide live demo of IoT technologies.

Serving as an industry support platform that enables the development of IoT businesses and the delivery of Radio Frequency Identification (RFID)/ IoT-related services for continuous development and competitiveness surge in different industries, this Hong Kong's Iconic RFID / IoT Showroom with live demo accelerates knowledge exchange, industry adoption and innovative creation. This RFID/IoT Technologies hub allows visitors to "touch & feel" and "see & believe" the power of IoT and forges the technological collaboration and standardization between Hong Kong and other countries.

The IoT Centre is divided into 5 themed zones – Manufacturing, Logistics, Retail, Healthcare and Smart City. Numerous industry-specific supply chains are live showcased from the point of manufacturing, logistics to warehousing, distribution, and the point of sales at these zones. The live demo shares best practices of applying Internet of Things enabling technologies spanning from sensors, M2M, cloud computing, big data, data analytics, to storage, security, mobility, business intelligence, etc with the ultimate goals to uplift business performance, customer satisfaction and the betterment of the society.

# About GS1 Hong Kong

Founded by the Hong Kong General Chamber of Commerce in 1989, GS1 Hong Kong is the local chapter of GS1, a not-for-profit, global supply chain standards organisation headquartered in Brussels, Belgium, with over 110 national chapters in 150 countries. GS1 Hong Kong's mission is to enable Hong Kong enterprises to have more efficient, visible and safer supply chains through the provision of global standards and a full spectrum of standards-based solutions and services, thus making possible business optimisation and value creation. It engages with communities of trading partners, industry organisations, governments, and technology providers to understand and respond to their business needs through the adoption and implementation of global standards.

# Making Smarter Hong Kong, Smarter Living

Information and communications technology (ICT) is not only a key enabler under printing Hong Kong's thriving economy; it is also taking shape as an economic sector in its own right. Recent radical and fast developments in IoT have reshaped many industries, business models and the interaction between people, businesses and governments. Hong Kong, with its excellent hard and soft infrastructure and a population with a strong global and regional reputation for trade and financial business acumen, the opportunities arising from physical and cultural proximity to Mainland China combined with the next generation of technology like IoT provides potential for Hong Kong to thrive among other competitive economies.

Chapter 2 of the HKSAR 2014 Digital21 Strategy Paper themed "Smarter Hong Kong, Smarter Living" outlined the following:

*In propelling Hong Kong into the next stage of ICT development, we need to fully exploit the latest technologies and adopt them in various sectors with a view to powering their further advancement*

- *Cloud Computing*
- *Big Data Analytics*
- *Internet of Things*
- *Wireless & Multi Platforms*

IoT is being recognised as one of the latest technologies Hong Kong should champion and adopt.

Chapter 5 of the consultation paper themed "Supporting a Thriving ICT Industry" and under clause (N) Closer Collaboration with the Mainland outlined the adoption of IoT technologies will further facilitate cross border trades:

*Moreover, to take advantage of our closer geographical proximity to and economic ties with Guangdong, we will further enhance co-operation between Hong Kong and Guangdong in the following areas:*

- *Collaborating in developing a cluster of smart cities in the Greater Pearl River Delta Region*
- *Wider application of Internet of Things Technologies to facilitate cross- border trade*
- *Opportunities arising from Nansha*
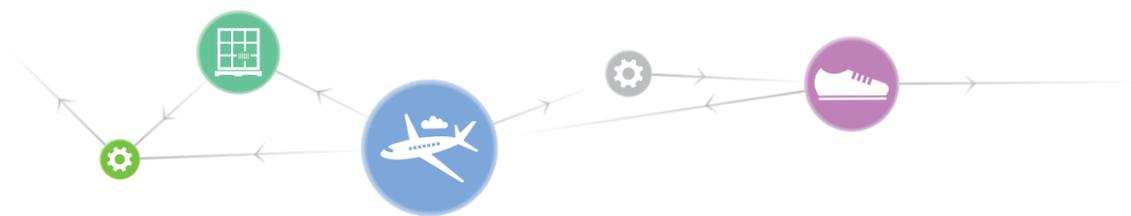
The Paper reaffirmed that Hong Kong should leverage on the latest technologies and next ware of technological advancement in driving Hong Kong's further development. Around the world, we are witnessing how new technologies including wireless, cloud computing, big data and Internet of Things, are being exploited to boost the development in different businesses and industries. In order to stay in the forefront of the increasing digitalised world, Hong Kong has to embrace these technologies and apply them in powering the economic and social development in the years to come.

In the 2015 Policy Address under Chapter 2 Lands, Housing & Transportation, a new initiative named "Energizing Kowloon East" is introduced with the aim to carry out a pilot study in Kowloon East to examine the feasibility of **developing a Smart City**, such as using **technology to enhance pedestrian and vehicular accessibility** and manage the district facilities, and disseminate information to the public in digital format, with a view to **making the area a better place for work and play.** The pilot emphasises the use and adoption of advance ICT technologies including Internet of Things to make a better Kowloon East for the citizens. Ultimiately, the pilot serves as a role model for other districts to be transformed into smart cities in future.

## Smarter Business Contributes to the Substainable Economic Growth of Hong Kong

EPCglobal Hong Kong was established by GS1 Hong Kong in 2004 to promote the EPC standards and drive adoption to make smarter business with Internet of Things. A series of industry support programmes were introduced to raise the awareness of the standards, to acknowledge the pioneers and industry role models, to transfer knowledge on the implementation best practices and technology to support industry application and adoption. One of which is the establishment of the pioneering Hong Kong EPCnetwork Infrastructure to enable end-to-end supply chain visibility, sponsored by the Innovation and Technology Commission, HKSAR Government under the Hong Kong Technology Cooperation Funding Scheme (TCFS) from 2005 to 2007.

This was one of the foundation projects of the R&D Centres established by Innovation and Technology Commission, HKSAR Government. The project pioneered the building of the EPC infrastructure based on EPC standards and integrating it with real industry users of global supply chain in 4 cross border pilots including Wal-mart, Maersk Logistics, vTech, Esquel, GroupSense with the ultimate goal to harmonise the logistics flow and information flow of the products moving along the supply chain which involves tremendous business event data generated from different supply chain processes. Hence, the EPC network infrastructure, now named as ezTRACK was one of the pioneering network infrastructures to realise Internet of Things and handling structured and big data along the value chain to optimise the global supply chain from sources to stores while uplifting the service quality of Hong Kong as Asia's leading logistics hub for the global marketplace.

# Smart Shopping

# Consumer Connect
One Scan, Multiple Connections

By GS1 Hong Kong

## Background and challenge

Today's increasingly technology-savvy consumers can have access to much more information than before. Brand owners and retailers who can develop effective communications to interact with consumers through the preferred channels and technologies can better deliver strong product values and brand image in the marketplace.

## Solution

Consumer Connect is a ready-to-go mobile app that features information on product and promotion. It gathers the information of over 1 million products on its cloud with an easy-to-use system for brands to update and deliver their new information.

By scanning the GS1 barcode on the packaging of the product with the Consumer Connect app, consumers can gain the information provided by brand owners anywhere, any time. Brands can also use the product barcode as a hassle-free channel for promotion, offering latest promotion information to consumers. Brand owners will get the first hand market information and insights of top scanned and shared items of the consumers.

## Benefits

• Protecting brand reputation and enhancing customer loyalty

• Effective directly connecting brands and consumers and integrating online and offline
   campaign for more consumers engagement with conventional barcode

• Understanding consumers' behaviors from consumer insight report
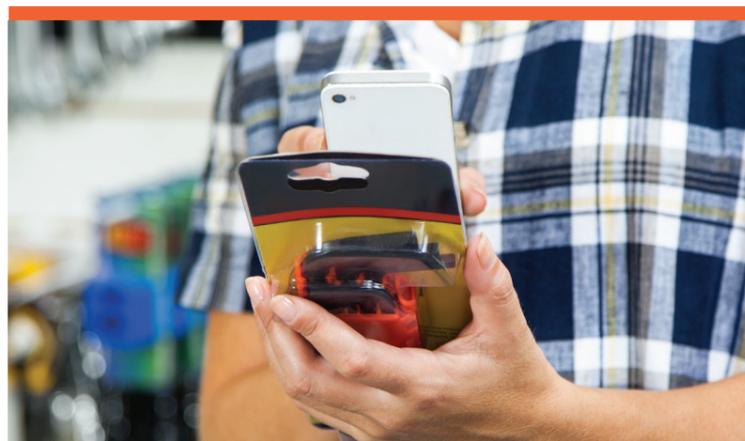
# ICS RFID-technology Deployment (IRD)
RFID Adds Values to Jewellery Retailing

By Chow Tai Fook Jewellery Group Limited
*Gold Award Winner of "RFID Implementation Excellence" and "RFID Implementation Application", HK IoT Awards 2014*

## Background

Chow Tai Fook Jewellery Group Limited is the largest jeweller listed in Hong Hong. It is also the world's largest for sales and one of the  largest by market capitalisation.

The iconic brand "Chow Tai Fook" of the Group has been widely recognised for its trustworthiness and authenticity, and renowned for product design, quality and value. The Group has an extensive retail network comprising over 2,250 Chow Tai Fook and Hearts On Fire points of sale spanning nearly 500 cities in Greater China, Singapore, Malaysia, South Korea and the United States, as well as a strong and fast growing e-tail network

## Challenge

In retail business, retailers face various challenges. Tedious and time consuming stock taking routine distracts sales staff from performing sale duties and providing customer service. Substantial products are in transit frequently, making it difficult to track them. It is also difficult to capture data on customers' preference and shopping behavior during the sales process.

## Solution

Chow Tai Fook has adopted a RFID-enabled and IOT integrated inventory control system (ICS) developed in-house, which is designed as a real-time, web-based and generic item level cloud system Ffeaturing the use of RFID-enabled price tags together with various smart tools that are also RFID-enabled, namely logistic trays, mHand and Smart Tray.. This award-winning innovative technology application "ICS RFID-technology Deployment" is the first of its kind that provide comprehensive and viable solutions  for the three significant aspects of retailing – logistics management, retail stock taking and sales operations.

First of all, with the use of the three smart tools that are all integrated with the ICS system, the RFID-enabled price tag of each product contains a unique product ID with the respective product information allowing product traceability in all stages of the business flow. The Smart Tray can show a handful of product information essential for providing professional sales service on the one hand and collect big data for business analysis on the other. The logistics tray can read product codes in lots of tens when they are placed on it versus the traditional way of shooting barcode one by one. The mHand, a portable handheld RFID device, serves as a scanner to read the codes of the products that are displayed inside the glass counters and showcases saving the trouble of having each and every piece taken out and put back.

## Benefits

• Reducing stock taking time by 50%

• Improving sales conversion rates

• Enhancing corporate image as a
   forerunner and industry leader in
   innovative technology
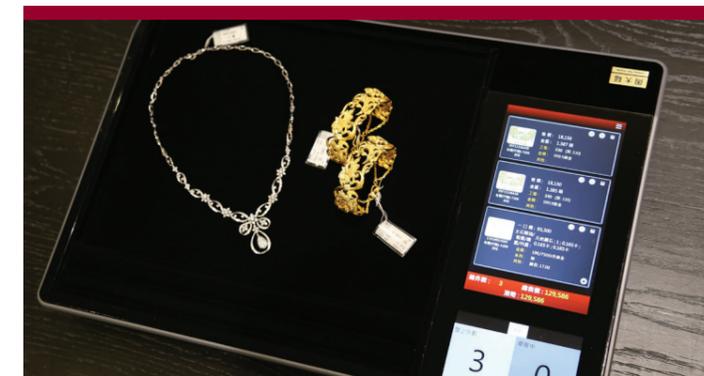
# IoT-enabling Technologies for the Pearl Industry
## Enabling Traceable Pearls with Unique Identities

By Fukui Shell Nucleus Factory Limited
*Silver Award, Best Smart Hong Kong (Internet of Things Application), Hong Kong ICT Awards 2015*

## Company background
Fukui Shell Nucleus Factory is a Hong Kong-based company specialising in manufacturing and supplying pearl nuclei and pearl farming operation tools to pearl farms around the world. It has a global market share of approximately 30% in pearl nuclei supply and its clients include some of the largest and best pearl cultivators in the world.

## Challenge
The challenges are in identification and traceability.

As pearls don't come with detailed information, their value is based on their five visible qualities, namely, lustre, size, colour, shape and spot. However, two similar-looking pearls may come from different areas with different prices. Unethical salespersons may sell the pearls using false information to customers.

Traceability is another issue in the pearl nuclei industry. In order to get a presumable higher quality at a cheaper price, bleaching or whitening agents, and also illegal materials are used. The result will be devastating due to the yield of low quality pearls as well as the easily-cracked pearls upon drilling. Thus pearl cultivators have always wanted to know the origin of their pearl nuclei, but are unable to find out.

## Solution
Fukui Shell embedded an EPC Gen2 RFID chip encoded with a unique EPC number in the "seed" (pearl nuclei). Each seed carries a unique identifier all the way down the value and supply chain to the hands of the consumers. The globally standardised EPCIS infrastructure provides each pearl's pedigree at any capturing points. Along with the physical grading, EPCIS assures each pearl's identity. This solution is also the runner-up of Best Internet of Things Deployment, RFID Journel Award.

## Benefits
• Treating and selling each pearl as a unique entity
• Providing provenance of each pearl
• Encouraging industrial standardisation
• Protecting clients from buying counterfeit pearl products

福井製核所
Fukui Shell Nucleus Factory

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# Value+
## Boosting Consumer Confidence and Protecting Brand Reputation

By GS1 Hong Kong

## Background and challenge
As market landscape continues to evolve, enterprises are faced with increasingly complex challenges. Retaining customer loyalty remains one of these concerns. Today's digital-savvy consumers tend to check out the products before making purchase decisions. They also favour a more personalised shopping experience, in addition to price discounts and promotional offers.

To compete for their dollars and loyalty, companies must strive to create value through service enhancements. Value does not necessarily equate to the lowest price, but the level of customer satisfaction based on the quality or worth delivered by the product or service purchased. In a way, it reflects the extent of importance that the retailer attaches to fulfilling the customers' every need.

Brand owners, distributors and retailers are also obliged to protect their customers' interests as well as their own against counterfeiting and grey market activities proliferating around the world.

## Solution
GS1 Hong Kong launched Value+, a brand protection and consumer engagement solution that appends a unique serialisation number label to allow end-to-end e-Pedigree visibility to bolster consumer confidence and enable personalised post sales engagements. By scanning the product's QR code on the packaging, customers can obtain unique product features and creative content. They can even fill in a simple online form to activate their product warranties, enjoy promotional offers, participate in lucky draws, redeem free gifts and e-coupons.

## Benefits
• Enhancing services including warranty registration, discount and e-coupon offers and loyalty programmes on a single mobile platform
• Assuring consumers about product authenticity
• Protecting of brand reputation and image
• Enhancing shopping experience and consumer confidence

**Value+**

# Smart Transportation

## HKBus+
### One App, All Real-time Transportation

By Axon Labs Limited
*Best Smart Hong Kong Grand Award and*
*Gold Award, Best Smart Hong Kong (Public Sector Information Application), Hong Kong ICT Awards 2015*

### Background

Believing that every person is empowered by information and communication technologies that are easily accessible through digital mobile devices in daily life, Axon Labs specialises in Mobile Application Development, Big Data Analytics and Cloud Computing.

### Challenge

Different transportation companies such as MTR and bus companies have their own apps. Commuters have to switch from one app to another to obtain the information they require about various transportation means. This is quite troublesome for those commuters needing to use different transportation means every day.  Thus, Axon Labs decided to create an app that integrates all the real-time information.

### Solution

Based on the open data released by the HKSAR Government as well as the data collected online, the mobile app HKBus+ offers comprehensive public transportation information in Hong Kong, covering franchised buses, mini-buses, MTR, ferries and trams.  It provides many functions, including point-to-point route search, nearby stops and stations, alighting reminder, transit suggestions and taxi fare estimation. Additionally there are various personalised functions, such as searching for routes to go home, and allowing users to keep their favourite routes and destinations. In the future, HKBus+ will periodically retrieve traffic information about the three cross-harbour tunnels from the Transport Department. This will be presented to users to allow them to choose the most suitable time and mode of public transport to cross the harbour.

### Benefits

• Enabling commuters to choose the most suitable transportation based on real-time information

• Making Hong Kong a smart city

# IoT-based Advanced Automobile Parking Navigation System
## Realising Hassle-free Parking

By Sino Parking Services Limited and Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University
*Silver Award, IoT Implementation Excellence and IoT Application Innovation, Hong Kong IoT Awards 2014*

## Company background

Established in 1987, Sino Parking Services Limited ("Sino Parking") is one of the largest and most experienced car park operators in Hong Kong with more than 110 car parks and over 17,000 parking spaces under management. The Department of Industrial and Systems Engineering of the Hong Kong Polytechnic University ("PolyU") actively engaged in collaboration with industry via joint research projects, consultancies, and teaching company schemes.

## Challenge

Hong Kong's increasing numbers of private vehicles lead to difficulty in finding parking space. For drivers, the lack of clear directions on actual routes to the car park is frustrating. Furthermore, searching for vacant parking bays inside the car park is a hassle, wasting time and fuel. Pollution inside the car park is exacerbated by the vehicles driving round and round. Ultimately, the unpleasant experience will erode customers' goodwill and affect the car park's reputation. Car park operators find it necessary to deploy more staff to monitor parking bay vacancies in real time. This will drive up their operational costs. Due to the low transparency of parking vacancy information, some car parks cannot be fully utilised.

## Solution

An IoT-based automobile parking navigation system has been jointly developed by Sino Parking and PolyU, to provide an end-to-end solution to give drivers a better parking experience. The system provides solutions for guiding drivers to their selected Sino car park, enabling them to enter the car park using an Octopus card or a NPC-enabled smartphone, guiding them to the available parking bay, and recording the location of the bay where the vehicle is parked. It also monitors the car park's environmental quality and selects parking schemes with the lowest parking fee for drivers.

## Benefits

- Raising customer satisfaction and attracting more drivers to choose car parks with automation technology
- Optimising the operational efficiency for monitoring and managing the payment operation system
- Helping customers to save time and fuel
- Enhancing air quality in car parks

信 和 停 車 場
Sino Parking

# Smart Healthcare

# Mobile Heart Health Monitoring System
## Ensuring Patients' Safety by Heart Conditions Tracking

By Hong Kong Applied Science and Technology Research Institute Company Limited
*Gold Award, Winning IoT Technology, Hong Kong IoT Awards 2014*

### Background

Hong Kong Applied Science and Technology Research Institute (ASTRI) was founded by the Government of the Hong Kong Special Administrative Region in 2000 with the mission of enhancing Hong Kong's competitiveness in technology-based industries through applied research. ASTRI's core R&D competences are organized under 7 Technology Divisions, namely IC Design (Analog), IC Design (Digital), Opto-electronics, Electronics Components, Software and Systems, Security and Data Sciences, and Communications Technologies.

### Challenge

Monitoring chronic heart-related medical conditions has become increasingly important for patients and their caregivers. Failure to monitor chronic heart problems closely could result in acute exacerbations, long-term complications and even death. However, existing devices designed for this purpose are costly, large and unwieldy. Frequent examinations of the patients' heart conditions at hospitals and clinics are not only inconvenient but also time-consuming.

### Solution

A Mobile Heart Health Monitoring System, developed by ASTRI, is a new model of medical monitoring based on sophisticated computer networks, modern communications and sensor technologies. It is a low-power wireless electrocardiography (ECG) device in a miniature size module that allows heart patients with stable cardiac conditions to monitor their heart health anytime and anywhere using a smartphone, electronic tablet or PC, after being discharged from hospital. It consists of a low-power, highperformance mixed-signal integrated circuit (IC), a compact PCB board, and a multiple platform software interface compatible to Android and Windows systems, with a remote database server. The data captured can be viewed on the host device or uploaded to a remote server in real time, thereby enabling physicians, nurses and other caregivers to be informed as well as monitor and diagnose the patients' evolving heart conditions remotely.

### Benefits

- Improving current generation of ambulatory ECG monitoring devices
- Enabling less waiting time at comparatively low costs
- Providing healthcare practitioners with instant access to real-time information about patients' conditions
- Facilitating emergency medical intervention to be undertaken if needed

**ASTRI**
HONG KONG APPLIED SCIENCE AND TECHNOLOGY
RESEARCH INSTITUTE COMPANY LIMITED
香港應用科技研究院有限公司
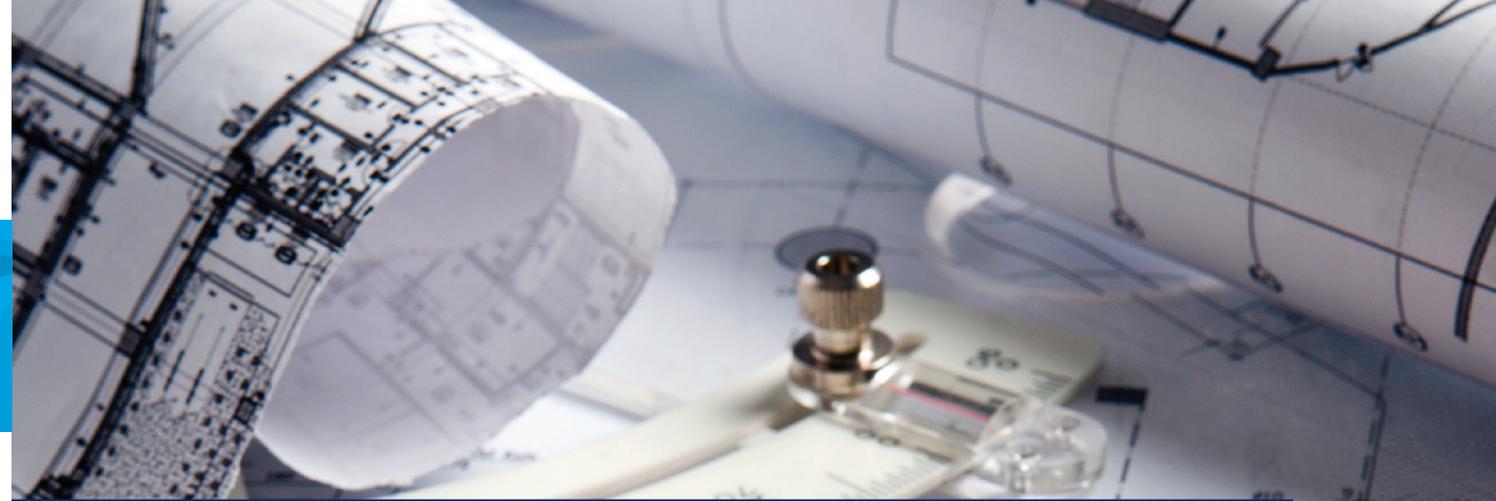
# Smart Building and Construction
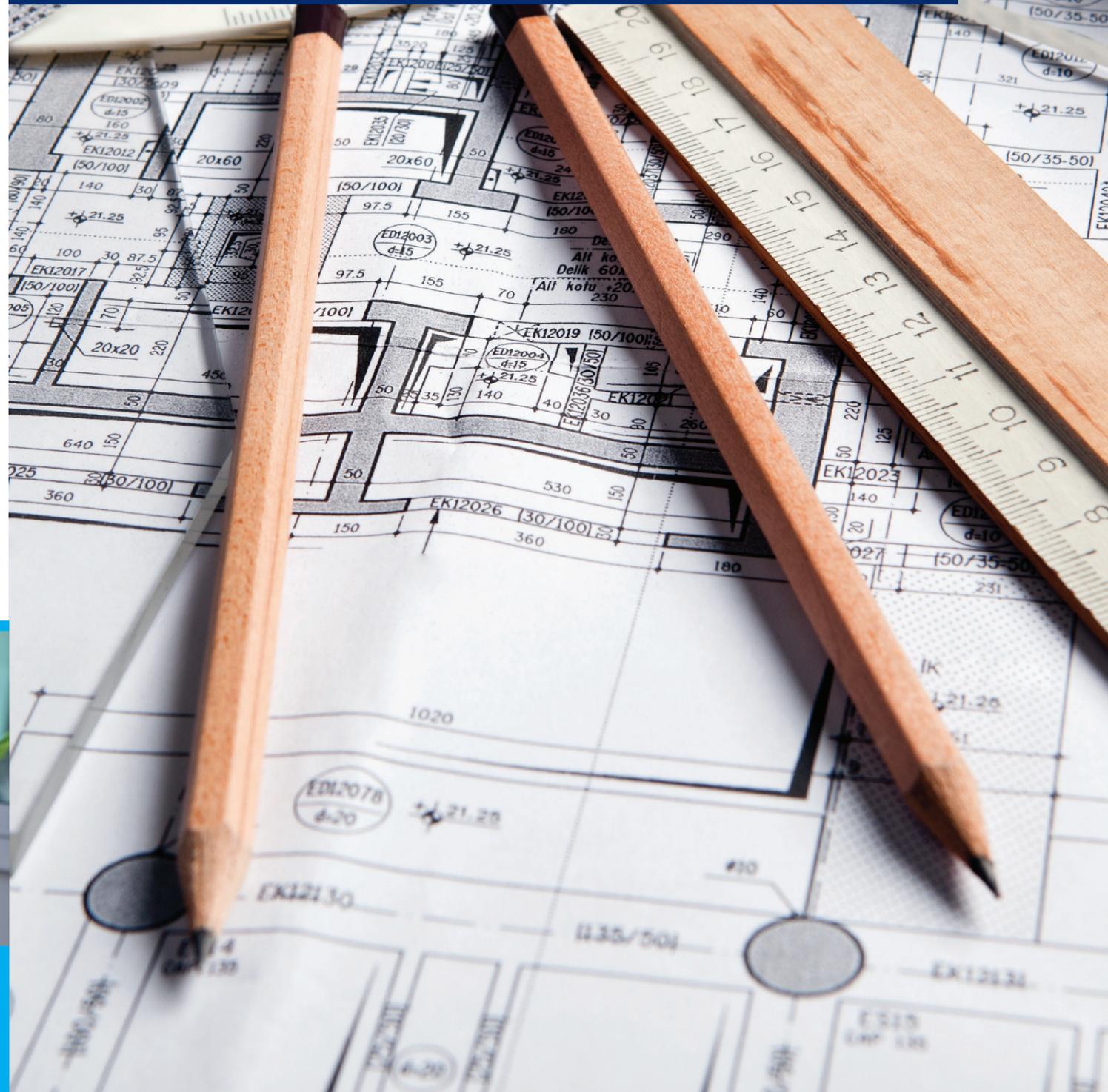
# Equipment Height Real-time Monitoring System (EHRMS) for Hong Kong-Zhuhai-Macao Bridge Project
## Ensuring Smooth Construction

By DigiMobi Technology Limited / FT Laboratories Limited / Rodsum Wireless Limited
*Silver Award, Best Smart Hong Kong (Public Sector Information Application) , Hong Kong ICT Awards 2015*

## Company background

DigiMobi Technology is a solution/service provider on Telematics, M2M solutions and IoT Applications. FT Laboratories Ltd is one of Hong Kong's leading construction laboratories for site monitoring service. Rodsum Wireless Ltd is a R&D Centre on GSM/GPS/WiFi Hardware and Tracking Solution. These three companies worked together to develop Equipment Height Real-time Monitoring System ("EHRMS").

## Challenge

As the Hong Kong section of Hong Kong – Zhuhai-Macao Bridge is very close to the airport, it is essential to ensure that the height of the crane/jib meets the Airport Height Restriction ("AHR").

## Solution

EHRMS was designed and installed on the jib of a crane barge working on the HK-Zhuhai-Macau Bridge Hong Kong Link Road Construction Site. EHRMS collects real-time public information on GPS, AHR, the height of tides at the airport as well as the information on jib inclination angle, and the draft height.

Once the height exceeds the AHR, mandated by Civil Aviation Department (CAD), EHRMS will send out a warning immediately which will not cease until the operators lower the jib to the safety level. At the same time, the system will notify the contractor with a SMS message and email the CAD. In this way, the system can monitor the site and achieve remote management. Over 30 systems have been put into operation in 2013 and will keep working till 2016.

## Benefits

- Safeguarding aircraft safety by 24x7 monitoring on whether crane barge exceeds AHR
- Ensuring the smooth construction of the Hong Kong – Zhuhai-Macao bridge (Hong Kong section) with an easy-to-understand interface for onsite construction workers
- Empowering off-site monitoring through website for people working in the office



DigiMobi Technology Limited 圓方電信科技有限公司

FT Laboratories Ltd. 科達測檢試驗所有限公司

RODSUMWIRELESS



1st Barge installed with EHRMS System

① GPS Antenna
⑤ Audio-Visual Alarm
② Main Controller Unit
③ Tilt Sensor
④ Draught Sensor

# Construction Stage Tunnel Access Control System (TACS)
## Safeguarding Tunnel Construction Site with RFID

By ATAL Technologies Limited / MTR Corporation Limited
*Bronze Award, Best Smart Hong Kong (Internet of Things Application), Hong Kong ICT Awards 2015*

## Company background

The ATAL Integrated IT Solutions is part of Analogue Group of Companies, specialising in providing a complete solution of implementing and maintaining infrastructure communication, security and access system for building owners, large corporations, institutions and government organisations.

## Challenge

Safety is of paramount importance in the engineering industry whether it is during construction or when normal operations have commenced. To secure a high incident handling efficiency, the MTR Corporation Ltd (MTRC) required a comprehensive solution to keep track of thousands of workers within the Express Rail Link tunnel construction sites.

## Solution

ATAL's custom-built Tunnel Access Control System (TACS) integrates advanced active RFID technology, 3G telecommunications and customised software to keep track of workers with RFID tags installed in their helmets and RFID readers within different tunnel segments inside the 26-kilometre long tunnel site. The tags have long detection ranges effective up to 50 metres away from the RFID readers. In addition, this system is combined with software specially made for the unique demands of tunnel environment.

## Benefits

- Ensuring the construction safety of workers
- Raising safety levels in a challenging long tunnel environment
- Shortening response time in the event of accident or emergency



ATAL TECHNOLOGIES LTD
安樂創新科技有限公司

# Smart Living

**Smart Home**

QUICK LOOK

0.25 kW in use
54.75 kW total

2.3 L/m in use
125.5 L total

1 door is open
3 doors total

Electricity

Cameras

Thermostats

Security

Voice Assistant

Water

Door locks

Alerts

Lights
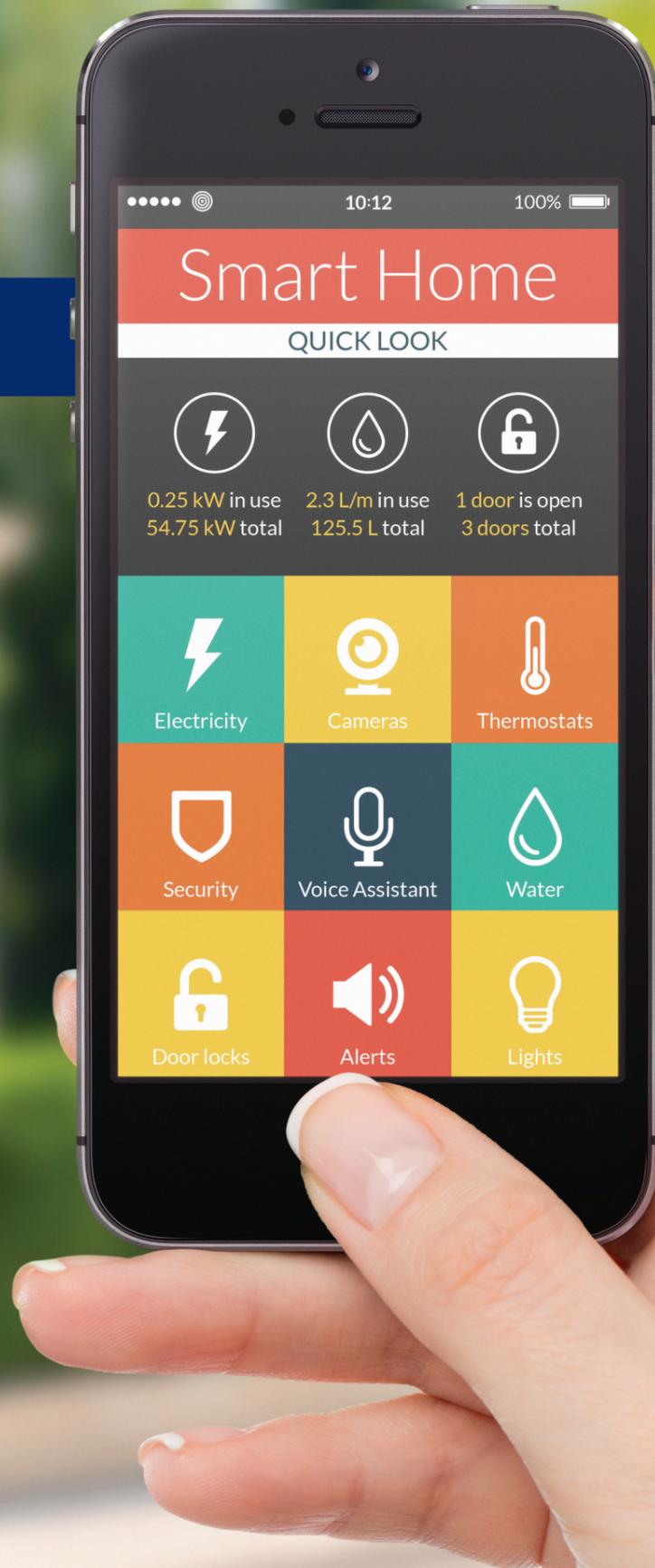
# Ambi Climate
## The Smart Add-on to Air Conditioners

By Ambi Labs Limited
*Gold Award, Best Smart Hong Kong (Internet of Things Application), Hong Kong ICT Awards 2015*

### Company background

Founded in 2012, Ambi Labs is Hong Kong-based, consumer Internet of Things startup. Their first product, Ambi Climate, is a smart home device that upgrades the intelligence of existing air conditioners ("ACs"). Using artificial intelligence and proprietary machine learning techniques, Ambi Climate revolutionizes the way households interact with their ACs.

### Inspiration

Air conditioners are a ubiquitous household appliance across Asia. Nearly 40% of households in the region have at least one AC, and they account for approximately 30% of residential energy consumption.

Still, many users have difficulty staying comfortable with their ACs. Ambi Labs conducted over 50 interviews and surveyed over 4,000 AC users across the region, with 72% of respondents reporting challenges in staying comfortable with their ACs.

Many of these issues were due to the inability of air conditioners to cope with changing outdoor weather conditions. For example, in Japan, where ACs are utilized for heating as well as cooling, users wondered why their AC wasn't smart enough to compensate for a cold day by turning up the temperature. Similarly, Singaporean users asked why their ACs were not able to adapt to the rapidly changing outdoor conditions that occur during the country's frequent thunderstorms. In Hong Kong, and elsewhere, users commonly complained that their AC felt warm and stuffy at 24°C but freezing cold at 23°C.

### Solution

Ambi Climate is designed to solve this problem - the main usability challenge that Asian consumers have with their ACs. Its end-to-end system includes four components that work in concert with each other: a hardware device, artificial intelligence, Ambi Cloud, and the smartphone app interface.

The hardware device contains several accurate sensors that collect data from inside the home, such as temperature, humidity, light levels and motion, as well as the user's comfort feedback from the smartphone app. This information is uploaded via WiFi to the Ambi Cloud where proprietary machine learning techniques analyse the indoor sensor data as well as outdoor weather and the user's AC preferences.

This analysis allows the system to extract insight about the user and their home environment to understand how to set the optimal AC settings for the user's comfort. These settings are sent back the device to control the air conditioner automatically, delivering a "tailor made" indoor climate that reduces overcooling and energy waste.

### Benefits

- Making any remote controlled AC unit intelligent
- Automatically adjusting the AC for personalised indoor comfort and lower energy consumption
- Conveniently accessing and controlling the AC remotely, from anywhere, at any time
- Preventing property damage attributed to moisture control and weather fluctuations
- Protecting loved ones and pets from mould or airborne bacteria

**ambi** labs

# Bluetooth Smart Home
## Smart Home in One-Go

By Lincogn Technology Company Limited
*Silver Award, Winning IoT Technology, Hong Kong IoT Award 2014*

### Company background

Lincogn Technology Company Limited specialises in R&D and manufacture of various Bluetooth electrical accessories. It is the leading brand to integrate the Bluetooth 4.0 (also sometimes referred to Bluetooth low energy / BLE) in remote control and automation to lighting, appliance and home control applications of all types.

### Challenges

The concept of smart home – which envisages smart TVs, appliances, air-conditioning and refrigeration and telecommunications connected and managed through a single integrated platform – has been talked about for over a decade. Yet, the implementation of such an idea has not made much progress, partly because the existing products are too complex or expensive. This applies to even the recently launched ones, which rely on routers and complicated setups.

### Solution

Lincogn Technology has developed Bluetooth Smart Home to tap potential demand in the smart home market. Its products are designed to replace the existing wall switches in ordinary homes, with no configuration required, because these Bluetooth-enabled items can be controlled by a proprietary app available for down-loading on smartphones. This system is a less complicated, easy-to-use, much more affordable option in home automation market.

### Benefits

- Realising smart home with more convenience (no router dependence, no pairing/configuration procedure) and lower price
- Controlling all the home appliances with one mobile device
- Reducing energy consumption and carbon footprints

# Smart Cultural Heritage

# E-charm Management System
## Temple Goes Digital with EPC/RFID

By Sik Sik Yuen
*Silver Award, Most Innovative Use of EPC/RFID, HK RFID Awards 2010*

## Company background

Sik Sik Yuen Wong Tai Sin Temple was founded in 1921 for the practice of Taoism, Buddhism and Confucianism and the worship of Master Wong Tai Sin. Managed by Sik Sik Yuen, it receives over 3 million visitors in search of blessings each year.

## Challenge

Most worshippers would use one of the 150 sets of fortune telling sticks with each set consisting of 100 numbered bamboo sticks in a bamboo holder. They shake the holder till one of the sticks falls out. The number on the stick corresponds with a prediction. To ensure each bamboo holder contained a complete set of sticks, 10 temple staff were assigned to manually check through the 150 sets of fortune telling sticks, with each inspection taking about 5 minutes to be completed. The temple wanted to find a new means to conduct inspections, which would be less time consuming and allow it to make more efficient use of its manpower.

## Solution

Sik Sik Yuen built an RFID-based e-Charm Management System for checking the sets of fortune telling sticks quickly prior to being lent out to worshippers. They used durable, waterproof and heatproof passive UHF RFID tags that were small enough to be implanted into each stick, and specially designed bamboo stick holders with built-in RFID readers and antennas. In addition, a device was developed to shake the sets of sticks while they were being scanned by the reader, in order to ensure an accurate count.

## Benefits

• Reducing the checking time for each set of fortune telling sticks from 5 minutes to 5 seconds

• Improving customer experience as each set of fortune telling sticks could be checked immediately prior to each use and be guaranteed that they are the right set